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The Role of Financial Economics in Securities Fraud Cases: Applications at the Securities and Exchange Commission

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INTRODUCTION

Litigants, including the Securities and Exchange Commission (SEC), increasingly have applied modern financial economics in securities fraud cases. One of the most important applications of financial economics for securities law comes from the efficient markets hypothesis. This Article presents an overview of areas where securities fraud law has adopted some of the reasonings and applications of the efficient markets hypothesis and provides examples of the use of financial economics in SEC enforcement action. Specifically, this Article discusses how techniques developed by financial economists can be used to establish the materiality of information allegedly used in securities fraud, and to compute profits (or losses avoided) resulting from fraudulent actions. It then shows how the methodology was applied in recent SEC enforcement cases.

A leading expert on the efficient markets hypothesis, Professor Eugene F. Fama of the University of Chicago's Graduate School of Business, recently reviewed the empirical evidence on the efficient markets hypothesis and defined market efficiency with the simple statement that security prices fully reflect all available information.¹ Fama noted that, while no market is perfectly efficient, the idea that prices quickly adjust to the release of new information is a useful tool to analyze many situations, especially when information and transactions costs are low, as in the United States stock market.

An event study, a technique developed and refined by financial economists, can be very useful in securities fraud cases. An event study relates changes in stock prices to the release of new information. Researchers have applied event studies to all types of events ranging from mergers to regulatory actions. In securities fraud law, event studies are particularly

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1. Eugene F. Fama, *Efficient Capital Markets II*, 46 J. Finance 1575 (1991).

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TABLE 3
Security Price Performance for Reebok and Avia International Surrounding Reebok's Acquisition
Announcement of Avia on March 10, 1987

Date	Reebok Stock Price	Reebok Abnormal Return	Z-stat	Reebok Cumulative Abnormal Return	Reebok March 40 Option Price	Reebok April 40 Option Price	Avia Stock Price	Avia Return	Avia Cumulative Return
Mar. 2	36.250				0.5625	1.2500	23.000		0.00
Mar. 3	36.250	-0.53	-0.15	-0.53	0.5000	1.4375	23.000	0.00	6.52
Mar. 4	35.875	-3.14	-0.89	-3.65	0.3750	1.1875	24.500	6.52	23.91
Mar. 5	36.500	0.55	0.16	-3.12	0.4375	1.3125	28.500	16.33	10.87
Mar. 6	36.875	0.60	0.17	-2.54	0.4375	1.4375	25.500	-10.53	8.70
Mar. 9	37.500	2.09	0.59	0.50	0.8125	1.8750	25.000	-1.96	-25.00
Mar. 10	41.750	9.90	2.80	9.34	2.5000	4.1250	17.250	-31.00	-25.54
Mar. 11	42.500	1.51	0.43	11.00	2.6250	4.3750	17.125	-0.73	-25.00
Mar. 12	42.500	-0.81	-0.23	10.10	1.8750	4.2500	17.250	0.73	-25.00
Mar. 13	43.000	1.21	0.34	11.44	3.1250	4.6250	17.250	0.00	-25.00
Mar. 16	42.250	-1.40	-0.40	9.88	2.4375	3.8750	17.250	0.00	-25.00
Mar. 17	42.875	-0.51	-0.15	9.51	2.9375	4.3750	17.250	0.00	-25.00

Notes: returns are expressed in percent; Reebok stock price data is from Center for Research in Security Prices (CRSP) at the University of Chicago. Market model estimation period is March 3, 1986 through March 2, 1987. Market proxy is CRSP value-weighted index of NYSE, AMEX and NASDAQ stocks. Beta estimate for Reebok is 1.22. Reebok call option closing prices come from the Wall Street Journal; Avia stock price is the midpoint of the bid/ask spread. The Avia stock price data come from the Portland Observer.

TABLE 4

Stock price performance for Winners Corporation Surrounding
Spillman's Delinquent Schedule 13D Filing on January 6, 1988
(required filing on December 28, 1987)

Date	Winners Price	Abnormal Return	Z- statistic	Cumulative Abnormal Return	Z- statistic	Volume/ Mean Volume	Spillman Volume/ Mean Volume
Dec. 11	1.500	8.71	1.62	8.71	1.62	0.25	
Dec. 14	1.575	-10.92	-1.93	-3.16	-0.41	5.48	1.14
Dec. 15	1.375	-0.05	-0.01	-3.22	-0.34	1.02	0.57
Dec. 16	1.500	7.32	1.36	3.87	0.36	12.54	12.80
Dec. 17	1.500	1.88	0.35	5.82	0.48	1.12	0.57
Dec. 18	2.250	47.96	8.80	56.57	4.26	13.53	5.67
Dec. 21	2.000	-11.22	-2.09	39.01	2.72	4.27	1.14
Dec. 22	2.000	0.21	0.04	39.50	2.57	5.46	0.11
Dec. 23	1.875	-7.29	-1.35	29.15	1.80	2.68	0.23
Dec. 24	2.000	7.15	1.33	36.39	2.25	0.42	0.22
Dec. 28	1.875	-5.58	-0.65	33.43	1.85	1.31	0.57
Dec. 29	1.875	0.65	0.12	34.31	1.83	6.01	2.22
Dec. 30	2.250	19.00	3.52	53.82	3.07	3.42	0.68
Dec. 31	2.250	0.44	0.08	60.55	2.99	0.90	0.90
Jan. 4	2.575	2.18	0.39	63.98	3.05	1.15	0.79
Jan. 5	3.000	4.26	0.79	70.97	3.28	1.12	0.51
Jan. 6	3.000	19.98	5.72	105.14	4.71	4.86	
Jan. 7	3.000	-0.53	-0.10	104.06	4.59	3.95	1.25
Jan. 8	2.875	2.23	0.38	106.61	4.58	0.78	0.94
Jan. 11	2.875	-0.99	-0.18	106.56	4.38	0.70	0.57
Jan. 12	2.750	-5.83	-0.62	99.87	4.00	5.23	3.97
Jan. 14	2.500	-9.05	-1.68	81.60	3.20	1.21	0.57
Jan. 15	2.625	5.20	0.97	91.05	8.50	1.98	
Jan. 18	2.625	-2.23	-0.41	86.78	3.26	0.84	
Jan. 19	2.500	-4.58	-0.85	80.04	2.88	0.06	
Jan. 20	2.500	1.41	0.19	84.95	3.01	0.01	
Jan. 21	2.625	5.06	0.84	94.30	3.28	6.13	
Jan. 22	2.750	3.72	0.69	101.53	3.48	0.11	4.62

Notes: Returns are expressed in percent. Stock price and volume data is from Center for Research in Security Prices (CRSP) at the University of Chicago. Market model estimation period is December 11, 1986 to December 10, 1987. Market proxy is CRSP value-weighted index of NYSE, AMEX, and NASDAQ stocks. Beta estimate for Winners is 1.01.

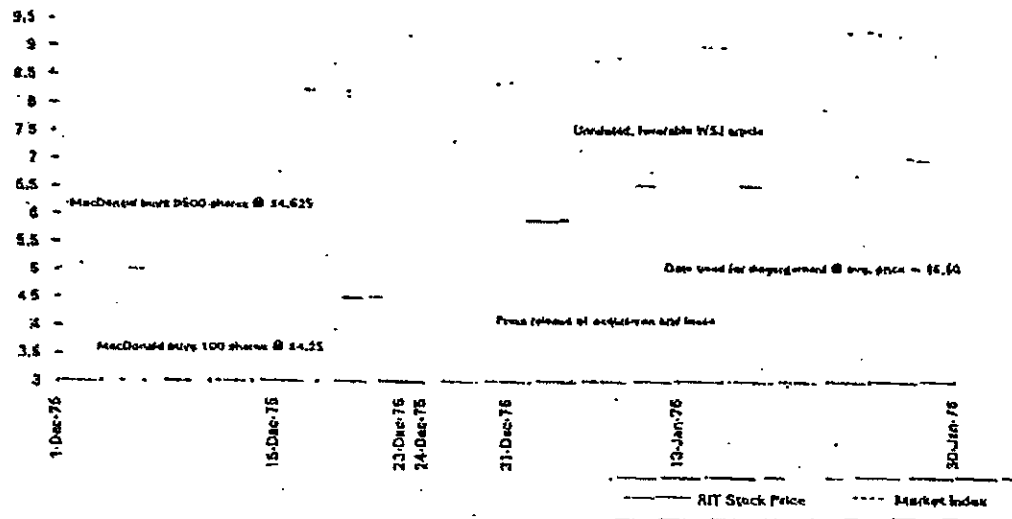
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FIGURE 1

Stock Price Performance for Realty Income Trust Associated with Insider Trading Prior to an Acquisition and Lease Announcement on December 24, 1975



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Intellectual because they allow the investigator to discern which information that is used in an allegedly fraudulent action is important to investors and to determine the value of the information. This Article illustrates the application of this event study methodology in SEC enforcement cases. The application, however, can be used easily in private suits as well.

While financial economics is becoming increasingly important in securities fraud law, both indirectly through the courts' approach to certain issues and directly through its application in specific cases, many litigants have not been exposed to this application or to a detailed description of the methodology. Recognition of the important relationship between economics and the law by the legal community, however, is not a new development. In 1897, Justice Oliver Wendall Holmes, Jr. said: "For the rational study of the law the black-letter man may be the man of the present, but the man of the future is the man of statistics and the master of economics."⁷ Over the intervening years, the legal profession adopted many economic theories and reasoning. The application of financial economics in litigation has lagged behind other fields in economics largely because many of the accepted theories in finance are relatively new.⁸ Today, the courts are more receptive to the use of financial economic analysis. For instance, in 1988 when the United States Supreme Court adopted the fraud-on-the-market theory in *Basic, Inc. v. Levinson*,⁹ it stated: "Recent empirical studies have tended to confirm Congress' premise that the market price of shares traded in well-developed markets reflects all publicly available information, and, hence, any material misrepresentations."¹⁰ This type of reasoning suggests the manner in which financial economics is used in securities fraud litigation and will be amply used in this Article. While litigants in private and public suits have used financial economics in connection with a variety of securities issues, this Article will focus on the recent application in SEC enforcement cases.

THE BASIS FOR FINANCIAL ECONOMICS ANALYSIS IN SECURITIES FRAUD CASES

In an influential article published in "The Business Lawyer" in 1982, Professor Daniel R. Fischel argued that in a rule 10b-5 suit the court should determine whether the stock price was "artificially affected by false information" instead of separate determinations into materially, reliance, causation.

2. Oliver Wendall Holmes, Jr., *The Path of the Law*, in *CRANFORD LECTURE PAPERS* 167, 187 (1920).

3. For example, it was not until 1990 that the Ninth Circuit (en banc) recognized finance as a legitimate scientific area of study within the field of economics and awarded the Ninth Circuit in *Basic, Inc. v. Levinson*, 897 F.2d 1048, 89-1204 (9th Cir. 1990), cert. denied, 495 U.S. 983 (1990).

4. 483 U.S. 234 (1987).

5. *Id.* at 246.

action, and damages.⁴ While courts have not followed Fischel's position unanimously, they have relied directly on the efficient market hypothesis in recent years with the use of evidence provided by expert testimony of financial economists and indirectly through the acceptance of many of the implications flowing from the hypothesis.

FRAUD-ON-THE-MARKET THEORY

The seminal adoption of financial economics in securities fraud litigation is in the fraud-on-the-market theory, which enables a plaintiff who has not actually seen a misleading statement to satisfy, nevertheless, the reliance requirement in a fraud suit. Fischel noted that the fraud-on-the-market theory originated to ease the proof of reliance in large class action suits.⁵ A derivative of the efficient markets hypothesis, the fraud-on-the-market theory assumes that investors rely on the market price of a security as a reflection of its value.⁶ Thus, a misleading statement that distorts securities prices is fraudulent even if the average securityholder has no knowledge of the statement.⁷ Applying the fraud-on-the-market theory, a court can presume the plaintiffs relied on the integrity of the market price for the securities they bought or sold, therefore dispensing with the traditional reliance requirement that the plaintiff relied on the fraudulent statement in making his or her investment decisions.⁸

The acceptance of the fraud-on-the-market theory varied among lower courts until *Basic, Inc. v. Levinson*.⁹ In this case, corporate officers of Basic, Inc. falsely denied the existence of on-going merger negotiations with Combustion Engineering during 1977-1978. In fact, "[n]ot only was Basic [Inc.] involved in negotiations, but on December 20, 1978, Basic [Inc.] announced that its Board of Directors had approved a tender offer by Combustion Engineering."¹⁰ Stockholders, who sold stock after officers in Basic, Inc. first denied merger negotiations and before the merger announcement, sued claiming a violation of rule 10b-5.¹¹ The United States Supreme Court held that plaintiffs may use the fraud-on-the-market theory to presume reliance so long as plaintiffs can show the affected shares traded in an "efficient" market.¹²

6. Daniel R. Fischel, *The Modern Finance Theory in Securities Fraud Cases Involving Activity Related Securities*, 58 *Bus. Law.* 1, 13 (1982).

7. *Id.* at 9.

8. See generally Jonathan R. Macey, et al., *Lessons From Financial Economics: Materiality, Reliance, and Resolving the Problem of Basic v. Levinson*, 77 *Va. L. Rev.* 1017, 1020 (1991).

9. 484 U.S. 168 (1987).

10. 485 U.S. 234 (1987).

11. *Id.* at 101 n.1.

12. *Id.* at 246.

13. *Id.* at 246. Inquiry into whether a stock trader in an efficient market is unnecessary. Instead, courts should address whether a misstatement caused the stock to trade at an artificially low or high price. Macey, *supra* note 8, at 1021.

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The fraud-on-the-market theory is useful to those attempting to satisfy the reliance requirement in private rule 10b-5 suits such as *Basic*. The acceptance of the theory by lower courts and the United States Supreme Court, however, also provided an intellectual basis for the application of financial economics in other contexts such as the SEC's use of financial economics in its enforcement actions. The two primary elements of rule 10b-5 cases that directly relate to SEC securities fraud cases are materiality and disbursement.

MATERIALITY

A key element of a rule 10b-5 case is proof that the fraudulent or inside information is material.¹⁸ The plaintiff must establish the importance of information provided in the fraudulent statements or of information excluded in insider trading.

Standards for Materiality

The materiality requirement originated in the common law of fraud, which is the basis for the courts' general interpretation of rule 10b-5. According to the United States Supreme Court, "materiality may be characterized as a mixed question of law and fact, involving as it does the application of a legal standard to a particular set of facts."¹⁹ Arnold S. Jacobs suggested there are three interconnected groups of materiality standards that courts use—reasonable investor, probability/magnitude, and market impact.²⁰

The United States Supreme Court in *Basic* described the reasonable investor approach as "[a]n omitted fact is material if there is a substantial likelihood that a reasonable shareholder would consider it important."²¹ The Court expressly adopted the reasonable investor standard of materiality for all section 10(b) and rule 10b-5 cases.²² The probability/magnitude approach concerns events that do not always take place. For example, in *Basic* the SEC urged the Court to treat preliminary merger negotiations as material under this probability/magnitude standard.²³ The SEC argued that while a merger might not actually result from negotiations, the possibility of the merger occurring combined with the potential large market impact indicates the materiality of information regarding

preliminary merger negotiations.²⁴ The third standard, market impact materiality in terms of whether the relevant information, if released, would have had an impact on the price of the affected securities.²⁵ The United States Court of Appeals for the Second Circuit, in the influential *SEC v. Texas Gulf Sulphur Co.* case,²⁶ defined materiality under the market impact approach as "those situations which are essentially extraordinary in nature and which are reasonably certain to have a substantial effect on the market price of the security."²⁷

These three standards, however, are certainly not mutually exclusive; some courts applied more than one standard in the same case. For example, in adopting the reasonable investor standard in *Basic*, the Court suggested the probability/magnitude test could be used to analyze the importance of a reasonable investor would attach to preliminary merger negotiations.²⁸ Similarly, in *Texas Gulf Sulphur*, the Second Circuit employed all three standards to determine the materiality of news about an ore discovery.²⁹ Most importantly for financial economics, courts sometimes applied a market impact test to determine whether information met the reasonable investor standard.³⁰

Materiality and Financial Economics

Information allegedly used in fraudulent activity that is important enough to affect security prices when publicly released provides compelling evidence that a reasonable investor would consider the information important in making an investment decision. In *SEC v. Time*,³¹ for example, the United States District Court for the Southern District of New York, using the reasonable investor standard to determine materiality in an insider trading case, stated: "The significance of this information to investors is highlighted by the temporary halting of trading in *St. Joe* securities and by the virtually immediate jump in price of *St. Joe* stock from approximately \$30 per share to approximately \$45 per share when the Scripps leader offer was publicly announced...."³²

Historically, however, evidence that information is important enough to impact a security price has not been a necessary condition for substantiating materiality. Plaintiffs often have not used security returns to satisfy

21. *Id.*

22. *Jacobs*, *supra* note 17, § 61.02[1][ii].

23. 501 F.2d 833 (2d Cir. 1967), cert. denied, 394 U.S. 976 (1969).

24. *Id.* at 848 (quoting Arthur Fletcher Jr., *Securities Trading and Corporate Information*).

25. *Basic*, 485 U.S. 224, 238-39, 250 (1988).

26. *Texas Gulf Sulphur*, 401 F.2d at 849-50.

27. *SEC v. Time*, 394 F.2d at 849-50.

28. *SEC v. Time*, 394 F.2d at 849-50.

29. 501 F.2d at 849-50.

30. *Id.* at 849-50.

31. *Id.* at 849-50.

32. *Id.* at 849-50.

18. See *David C. Lange, Investment Analysis and the Law of Insider Trading*, 70 Va. L. Rev. 1071 (1980), for an excellent discussion of materiality in SEC insider trading cases.

19. *SEC v. Time*, 394 F.2d at 849-50.

20. *Jacobs*, *supra* note 17, § 61.02[1][ii].

21. *Id.* at 849-50.

22. *Id.* at 849-50.

23. *Id.* at 849-50.

24. *Id.* at 849-50.

25. *Id.* at 849-50.

26. *Id.* at 849-50.

27. *Id.* at 849-50.

28. *Id.* at 849-50.

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the materially requirement without examining security returns associated with the release of the information.⁴⁹

The SEC recently began to use stock price evidence to show materially in securities fraud cases, especially insider trading cases. The SEC applied financial economics using evidence derived from economic theory and prior empirical research in addition to information from the actual case. First, economic theory and prior empirical research suggest the expected stock price reaction to the release of information for the event in question. For example, if the case involves suspected insider trading prior to an earnings announcement, a determination is made as to the expected stock price movement based on evidence accumulated from prior similar earnings announcements. The second component in using financial economics to evaluate the materiality of information is an examination of the stock price movement associated with the release of information for the case in question. A price change consistent with theory and prior evidence bolsters the establishment of materiality; and the larger the price movement, the more likely the information is material. Financial economics analysis is especially applicable for cases where the stock-price movement attributable to the release of information is relatively small, or where the stock exhibits high volatility.

DISCORGEMENT

The other potential application of financial economics in SEC enforcement actions involves disgorgement calculations.⁵⁰ Disgorgement requires defendants to "give up the amount by which [they were] unjustly enriched."⁵¹ Thus, disgorgement depends on the profits the defendant made from his or her fraudulent conduct, not the victims' losses. Additionally, the Insider Trading Sanctions Act of 1984⁵² allows for punitive penalties up to three times the amount of disgorgement.⁵³ The application of financial economics is especially relevant because the implication drawn

from the efficient markets hypothesis that security prices react only to the release of new information reduces the subjectivity in estimating profits from fraud.

Securities Fraud Disgorgement Cases

The courts first expanded the SEC's remedies for insider trading violations of rule 10b-5 beyond injunctions to include disgorgement in the *Texas Gulf Sulphur* cases during the late 1960s and early 1970s.⁵⁴ In *SEC v. Texas Gulf Sulphur Co.*,⁵⁵ the defendants, officers and employees of Texas Gulf Sulphur, purchased Texas Gulf Sulphur stock and call options a few days before the public announcement of a major ore discovery on April 16, 1964. The district court accepted the SEC's argument that the defendants be required to disgorge profits based on the difference between the price they paid for the stock and the closing stock price the day after the public announcement of the ore strike.⁵⁶ The court noted that by the day after the public announcement, "[t]he news was widely disseminated by the news media and was available to the investing public."⁵⁷ In subsequent private suits arising from the insider trading, the court required disgorgement based on the average of the highest prices for each of the twenty days after the public announcement.⁵⁸ In all cases, most of the defendants sold shortly after the announcement, so there was little difference between paper and actual profits.⁵⁹

In the second major SEC disgorgement case, *SEC v. Shapiro*,⁶⁰ the defendant, Norman Berman worked for a merger boutique. In January and February 1971, Berman purchased 1100 shares of Harvey's Stores stock at prices ranging from \$7.25 to \$23.75 while negotiating a merger between Harvey's Stores and Ridge Manor. On February 18, 1971, Harvey's announced an agreement in principle to merge with Ridge Manor—its stock price closed at \$24. A few days later, the proposed merger unravelled and Harvey's stock price declined. Berman subsequently sold his stock at prices ranging from \$21 to \$22 a share.

The district court held that Berman violated the insider trading laws by exploiting material, nonpublic information regarding the proposed

50. See, e.g., Jacobson, *supra* note 17, § 61.04.
 51. For additional discussion of disgorgement in SEC cases, see MICHAEL J. KAMARAK, *SECURITIES LITIGATION: DAMAGES* (1992 & Supp. 1993) and THOMAS C. ALLEN, *The Measure of Disgorgement in SEC Enforcement Actions Against Insider Trading* (Feb. 1994), 34 CATH. U. L. REV. 445 (1985).
 52. SEC v. *Torne*, 574 F.2d 1086, 1096 (2d Cir. 1977) (quoting SEC v. *Continental*, 470 F.2d 1061, 1074 (2d Cir. 1972), cert. denied, 404 U.S. 1024 (1971)).
 53. Pub. L. No. 98-578, 98 Stat. 1204 (modified in scattered sections of 15 U.S.C.).
 54. 15 U.S.C. § 78a-1(a)(2) (1968). For cases that were influential in establishing the method of calculating disgorgement damages, see *infra* notes 55-64. This Article does not address specifically the issue of calculating damages in private actions. The methodology presented in this Article, however, can be applied easily to such suits. See generally Bradford Cornell & R. Gregory Morgan, *Using Finance Theory to Measure Damages in Fraud on the Market*, 17 UCLA L. Rev. 821 (1990) (discussing *Torne* and the out-of-pocket measure).

55. Several cases arose as a result of insider trading in Texas Gulf Sulphur stock. The most famous case is *SEC v. Texas Gulf Sulphur Co.*, 410 F.2d 833 (2d Cir. 1969), cert. denied, 394 U.S. 976 (1969).
 56. 312 F. Supp. 77 (S.D.N.Y. 1970), aff'd in part, rev'd in part, 444 F.2d 1301 (2d Cir.), cert. denied, 404 U.S. 1005 (1971).
 57. *Id.* at 93-94.
 58. *Id.* at 93.
 59. *Kernikoff v. Texas Gulf Sulphur*, 509 F. Supp. 548, 553 (11, 12th 1970), aff'd in part, rev'd in part and now, *Mitchell v. Texas Gulf Sulphur*, 446 F.2d 910 (11th Cir.), cert. denied, 404 U.S. 1004 (1971).
 60. *Id.* at 35A-42.
 41. 494 F.2d 1301 (2d Cir. 1974).

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merger.⁴² The court required Bernstein to disgorge his paper profits based on the average price, \$23.80, of all transactions on February 18, the date of the public announcement of the tentative merger agreement, on the basis that he would have sold his stock at that price.⁴³ The Second Circuit explained that "[f]or public disclosure is made and all investors are trading on an equal footing, the violator should take the risks of the market himself."⁴⁴

While the courts applied paper profits in the *Texas Gulf Sulphur* cases and *Shapiro*, the SEC argued in favor of actual profits in a subsequent, influential insider trading case—*SEC v. MacDonald*.⁴⁵ The defendant, James F. MacDonald, purchased stock in Realty Income Trust (RIT) based on information regarding a pending acquisition and lease agreement. MacDonald, chairman of the board of trustees of RIT, learned of the agreement on December 15, 1975 at a board meeting and then purchased 100 shares at \$4.25 the following day⁴⁶ and 9500 shares at \$4.625 on December 23. On December 24, RIT issued a press release detailing the acquisition and lease agreement, disseminated by Dow Jones News Service and Reuters, and the stock price increased 19% to \$5.50. RIT's stock price steadily increased after the announcement for several days, and by the end of the next month the price climbed to \$7.125.⁴⁷ Figure 1 displays the daily closing price for RIT from one week before MacDonald's trades, December 8, 1975, through January 29, 1976.

MacDonald did not sell his shares immediately after the announcement; instead he waited more than a year before selling at roughly \$10 a share. The SEC argued that MacDonald should disgorge his actual profits.⁴⁸ While the district court accepted the SEC's argument,⁴⁹ the United States Court of Appeals for the First Circuit reversed the disgorgement decision holding that disgorgement should only be the amount of profit attributable to the basic information.⁵⁰ The First Circuit stated that profit should be based on the difference between the purchase price and the price "a reasonable time after the inside information had been generally disseminated."⁵¹ Moreover, "the court should consider the volume and price at which RIT shares were traded following disclosure, insofar as they suggested the date

by which the news had been fully digested and acted upon by the market."⁵² The case then was remanded to the district court to determine a reasonable time.⁵³

Upon remand, the district court used the price movement of RIT stock as evidence of full assimilation of the information.⁵⁴ The district court stated that the market did not fully digest the news immediately because the price continued to rise for several days after the December 24 announcement.⁵⁵ The court held that the price stabilized on January 13 and used the average price of \$6.50 on that day for disgorgement.⁵⁶ Thus, the court of appeals and the district court on remand did not follow exactly the approach of the courts in *Texas Gulf Sulphur* and *Shapiro*—the full information price was the closing price on the day after the public release of the information—claiming the information in *MacDonald* was "considerably less spectacular" than the *Texas Gulf Sulphur* ore strike.⁵⁷ Additionally, the district court recognized that part of the price increase subsequent to the lease-agreement announcement corresponded to a favorable *Wall Street Journal* story on December 31, 1975 regarding the sale of properties by RIT.⁵⁸ While the district court held that the *Wall Street Journal* story brought credibility to the press release,⁵⁹ the *Wall Street Journal* story did not pertain to the lease agreement announcement that was the basis of the insider trading.⁶⁰ MacDonald therefore appealed the finding of the district court and argued that the *Wall Street Journal* article was "an intervening, superceding, cause of the RIT stock price surge in early 1976."⁶¹ The court of appeals affirmed the judgment of the district court, saying it was "unable to conclude that the district court committed clear error in rejecting defendant's argument."⁶²

The *MacDonald* decision is an important precedent for determining SEC disgorgement calculation. First, the court of appeals in *MacDonald* reversed the lower court's method of profit calculation and recommended paper profits as in *Texas Gulf Sulphur* and *Shapiro*, strengthening the use of paper

42. *SEC v. Shapiro*, 549 F. Supp. 46, 54-55 (S.D.N.Y. 1972), aff'd, 494 F.2d 1301 (2d Cir. 1974).
43. *Id.* at 56.
44. *Shapiro*, 494 F.2d at 1309.
45. 600 F.2d 47 (1st Cir. 1979).
46. MacDonald placed a limit order to buy up to 20,000 shares at \$4.25 but only 100 shares were available at the price.
47. See *infra* Figure 1.
48. *MacDonald*, 600 F.2d at 51.
49. *SEC v. MacDonald*, Litigation Release No. 6073, 11981 Transfer Market Fed. Sec. L. Rep. (CCH) ¶ 98,008 (D.R.J. Apr. 23, 1981).
50. *MacDonald*, 600 F.2d at 50.
51. *Id.*

52. *Id.*
53. *Id.*
54. *SEC v. MacDonald*, 568 F. Supp. 111 (D.R.J. 1983), aff'd, 723 F.2d 9 (1st Cir. 1984).
55. *Id.* at 113.
56. *Id.* at 112.
57. *MacDonald*, 600 F.2d at 54.
58. *Id.* *MacDonald*, 568 F. Supp. at 112 n.1. The *Wall Street Journal* reported that a Bernstein firm planned to buy 15 of RIT's properties. Noting the three-day period surrounding the announcement, RIT's stock price increased from \$5.25 to \$5.875. See Realty Income Trust 507 *Notes*, Group Held for 15 Properties, WALL ST. J., Dec. 31, 1975, at B.
59. *MacDonald*, 568 F. Supp. at 113.
60. *SEC v. MacDonald*, 723 F.2d 9, 11 (1st Cir. 1984).
61. *Id.*
62. *Id.* at 10.
63. *Id.* at 10.
64. *Id.* at 11.

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profits over actual profits.⁶⁶ Second, the *MacDonald* decision held that a reasonable time must take place after the public release of information and before complete discrimination occurs.⁶⁷ Because the court of appeals held that the pattern of the price and volume movements after the announcements should be considered in determining a reasonable time period,⁶⁸ the SEC and the courts have had leeway in determining when a "reasonable time" has taken place.

MacDonald also illustrates that the use of financial economic analysis reduces the ambiguity in determining the reasonable time period. For example, financial economic analysis could have been applied to show that the price increase around the unrelated *Wall Street Journal* article was specific to the information in that article and not at all to the information that MacDonald used in his trading. Further, while the courts and the SEC held that the price increases that continued until January 13 were related to the inside information,⁶⁹ it so happens that the overall stock market increased substantially over this period.⁷⁰ To the extent that RTT's stock prices moved with the overall stock market, part of the increase in the price of RTT over this period could have been due to general economic conditions.

Disorgements in Schedule 13D Violations

Historically, the SEC confined disorgement to insider trading cases. Recently, however, the SEC has obtained disorgement for other violations such as delinquent Schedule 13D filings. The SEC requires that purchasers of more than five percent of the stock of a publicly traded company file a Schedule 13D within ten business days after crossing the five percent threshold.⁷¹ If the holder is intent on acquisition, the Schedule 13D provides information about the acquisition group including a list of its members and the group's intentions for the target company.⁷² The SEC also requires the holder to file amendments to Schedule 13D after the occurrence of material changes in the information contained in the original filing.⁷³

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Stock prices rise in response to Schedule 13D filings.⁷⁴ Therefore, shareholders who file a Schedule 13D later than required may be able to purchase shares subsequent to their Schedule 13D, triggering purchase at prices lower than they would have paid otherwise. This means that filing a delinquent Schedule 13D can lead to extraordinary profits that are subject to disorgement. The SEC first sought and obtained disorgement for an improper Schedule 13D filing in 1988 in *SEC v. First City Financial Corp.*⁷⁵ During February and March of 1986, First City Financial Corp. (First City), controlled by the Belzberg family, purchased over nine percent of the stock of Ashland Oil Company (Ashland). On March 25, 1986, First City announced its stake in Ashland. The next day, First City proposed a merger in a letter to Ashland and filed a Schedule 13D with the SEC detailing its ownership. Ashland responded to the proposal the following week by announcing the repurchase of the stake from First City.

The SEC alleged that First City and its vice president, Marc Belzberg, violated section 15(d) of the Exchange Act by filing the Schedule 13D later than required.⁷⁶ As of February 28, First City held 4.9% of Ashland stock. According to the SEC, on March 4 Bear Stearns purchased a large block of shares on behalf of First City through a put and call agreement.⁷⁷ The SEC claimed that this purchase gave First City beneficial ownership of the shares held by Bear Stearns and hence First City should have filed the Schedule 13D by March 17 rather than on March 26.⁷⁸ Thus, the SEC argued that First City purchased Ashland stock from March 17 to March 26 at prices that did not incorporate properly the impact of crossing the five percent threshold.⁷⁹

The SEC sought disorgement of approximately \$2.7 million, reflecting the difference between the price paid by First City for 890,100 shares purchased between March 17 and March 26 (average purchase price of \$48 a share) and the price at which Ashland repurchased the shares from First City on April 2 (\$51 a share).⁸⁰ The court approved the SEC's dis-

73. See Wayne H. Atherton & Richard S. Ruback, *An Empirical Analysis of the Interfirm Equity Investment Process*, 14 J. Fin. Econ. 523 (1985); Clifford G. Holderness & Dennis P. Sheehan, *Reactions to Scheduling The Filings on Six Continental Investors*, 14 J. Fin. Econ. 555 (1985).

74. 890 F.2d 1315 (D.C. Cir. 1989).

75. 74 F.2d 1323.

76. *Id.* at 1319. Under a put and call agreement, a broker buys stock for its own account at a set price, plus interest and commissions. To protect itself from market risk, the broker has the right to put the stock to the investor at the same price. In *First City*, the defendants argued that a misunderstanding occurred between Bear Stearns and First City in that First City merely meant to sell Bear Stearns that buying Ashland stock would be a good investment, not to buy and hold the stock for it. See *id.* at 1317-20.

77. *Id.* at 1320-23.

78. *Id.* at 1323-24.

79. *Id.* at 1330.

66. SEC v. MacDonald, 699 F.2d at 47, 55 (11th Cir. 1983).

67. *Id.* at 53-54.

68. *Id.* at 55.

69. *MacDonald*, 699 F.2d at 173.

70. See *infra* Figure 1.

71. 17 C.F.R. § 240.13d-1(b) (1989); see also *id.* § 240.13d-101, Schedule 13D implements section 13(d) of the Exchange Act, 15 U.S.C. § 78m(d) (1988).

72. 17 C.F.R. § 240.13d-101.

73. *Id.* § 240.13d-104.

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government estimate, noting that the precise measure of ill-gotten gains was not actual profits but that "disgorgement need only be a reasonable approximation of profits causally connected to the violation."⁸⁰

In *First City*, the court explicitly chose not to use financial economics to estimate the savings to the defendants of a late Schedule 13D filing, stating that "[d]espite sophisticated econometric modelling, predicting stock market responses to alternative variables is, as the district court found, at best speculative."⁸¹ Moreover, the court rejected the testimony of an expert witness employing financial economics who argued that factors in addition to the Schedule 13D filing contributed to the price increase during that period.⁸²

Disgorgement and Financial Economics

Financial economics analysis can be quite useful in estimating the amount of profits a wrongdoer must disgorge. When disgorgement is used as a penalty, the defendant must disgorge the profits realized from his or her fraudulent conduct. Financial economics can be used to provide unbiased estimates of these profits. This methodology is especially useful when the actual profits realized from the securities transactions do not equal the profits directly attributable to the fraudulent actions. To date, this analysis has not been used universally for disgorgement calculation, in part because it may appear complicated to the courts. As the court of appeals in *SFC v. First City Financial Corp.*⁸³ said, "[i]f exact information were obtainable at negligible cost, we would not hesitate to impose upon the government a strict burden to produce that data to measure the precise amount of the ill-gotten gains."⁸⁴ Despite these concerns, financial economics can play an important role in calculating disgorgement.

EVENT STUDY METHODOLOGY

An event study is a statistical technique that estimates the stock price impact of occurrences such as mergers, earnings announcements, and so forth.⁸⁵ The basic notion is to disentangle the effects of two types of information on stock prices—information that is specific to the firm under

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question (e.g., dividend announcement) and information that is likely to affect stock prices marketwide (e.g., change in interest rates). Eugene F. Fama, Lawrence Fisher, Michael Jensen and Richard Roll from the University of Chicago were the first researchers to apply this methodology. Their seminal work examined the stock price reaction to stock splits and subsequently was published by the *International Economic Review* in 1969.⁸⁶ Event study methodology has its foundation in the efficient markets hypothesis. This well-known hypothesis states that security prices reflect all available information.⁸⁷ While theoreticians have developed various definitions of this basic statement, for event studies the relevant definition is that stock prices reflect all publicly available information. Numerous event studies in the academic finance, accounting, economics, marketing, and legal literatures incorporated the idea that if stock prices reflect all public information, price changes around public announcements is due generally to the arrival of new information stemming from that announcement. Consistent with the efficient markets hypothesis, studies have shown that stock prices react quickly to the arrival of new information, often within a matter of seconds.⁸⁸

The execution of an event study is quite simple. It involves the identification of an event that causes investors to change their expectations about the value of a firm. The investigator compares a stock price movement contemporaneous with the event to the expected stock price movement if the event had not taken place. There are three basic steps in conducting an event study: (i) define the event window; (ii) calculate abnormal stock

86. Eugene F. Fama et al., *The Adjustment of Stock Prices to New Information*, 10 *Int'l Econ. Rev.* 1 (1969).

87. See Eugene F. Fama, *Efficient Capital Markets: A Review of Theory and Empirical Work*, 23 *J. Finance* 385 (1979) and Fama, *supra* note 1, for reviews of the literature on the efficient markets hypothesis. From time to time, the efficient markets hypothesis comes under intense criticism. For example, in the aftermath of the stock market crash of 1987, many commentators suggested that the crash invalidated the efficient markets hypothesis. For the most part, however, this hypothesis withstood such criticism and continues to be the most viable theory offered. To date, two studies remain the stock market crash with the efficient markets hypothesis. See Mark L. Mitchell & Jeffrey M. Netter, *Triggering the 1987 Stock Market Crash: Anticipation or Reaction in the Proposed House Ways and Means Tax Bill*, 34 *J. Fin. Econ.* 37 (1989) and Charles J. Smith et al., *Undermining of Portfolio Insurance and the Crash of October 1987*, 5 *Rev. Fin. Stud.* 505 (1992). More importantly, with respect to event studies described herein, even critics of the efficient markets hypothesis concur that the efficient markets hypothesis is relevant. See Lawrence H. Summers, *Does the Stock Market Reflectly Reflect Fundamental Value?*, 4 *J. Finance* 561, 568 (1986). This is because, as Fama points out, there is little debate that individual firm's stock prices respond quickly to the release of new information about that firm. See Fama, *supra* note 1, at 160. The debate about the efficient markets hypothesis is more concerned with the determinants of overall market fluctuations.

88. See generally James M. Poterba & Mark Wolfson, *The Intraday Speed of Adjustment of Stock Prices to Earnings and Dividend Announcements*, 13 *J. Fin. Econ.* 223 (1984); Larry V. Darn et al., *Trading Rules, Large Trades, and the Speed of Price Adjustment*, 4 *J. Fin. Econ.* 3 (1977).

60. *Id.* at 1231.

81. *Id.*

82. *Id.* at 1237.

83. 850 F.2d 1215 (7th Cir. 1989).

84. *Id.* at 1231.

85. See generally Cynthia Campbell & Charles Wesley, *Measuring Security Price Performance Using Daily Market Returns*, 57 *J. Fin. Econ.* 73 (1993); Lawrence M. Allen & Kristianne Mueller, *Applications and Event Study Methods in Litigation Support* (1992); Glenn Y. Hershovitch, Jr., *Profits and Abnormalities in Landmark Event Studies*, 57 *J. Bus. & Fin.* 292 (1991); Patricia P. Peterson, *Event Studies: A Review of Issues and Methodology*, 28 *Q. J. Bus. & Econ.* 36 (1989); Stephen J. Linn and David B. Warner, *Using Daily Stock Returns: The Case of Fama, French, 14 J. Fin. Econ.* 3 (1985).

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price performance around the event and (iii) test for statistical significance of the abnormal stock price performance.

DEFINING THE EVENT WINDOW

The first step in the event study is selecting an event window. The event window is the period when information about the event becomes available to the stock market and thus may affect the relevant company's stock price. For most publicly-traded corporations, the event is disseminated publicly by newswire sources such as Dow Jones & Company and Reuters. In the case of Dow Jones & Company, the news is distributed via the *Dow Jones Broadpage* immediately after receipt of the news release from the corporation or government agency. For the relatively important news releases, Dow Jones also reports the event in the *Wall Street Journal* on the next business day.⁸⁹

The efficient markets hypothesis is influential in determining the length of the event window. Because the efficient markets hypothesis, supported by considerable empirical evidence, suggests that stock prices react quickly to the release of new information, in many cases the event window will be relatively short, sometimes as short as one trading day. In determining the length of an event window, an important tradeoff exists. The longer the event window, the more likely the window includes the period during which all the new information about the event is released. The tradeoff, however, is that long event windows may include noise and information from other events, making it difficult to isolate the impact of the relevant event.

The extent of the difficulty in defining the event window length varies across events. In those instances where the release of new information is a complete surprise to the market, it is relatively easy to establish the beginning of the event period. Consider an airline crash, for example.⁹⁰ Because airline crashes are unanticipated, the first day of the event period is either the day of the crash or the subsequent trading day if the crash occurred after the market close.⁹¹ Even when it is easy to identify the beginning of the event window, it can be difficult to establish the end of the event window. In the airline example, the end of the period would depend on when all of the relevant information regarding the crash was made available to market participants.⁹² For some crashes, it may take

several days or perhaps even weeks before the market receives the relevant information; in these cases, a longer event window is more necessary than for a crash in which all information is available within a few hours. Following the crash,⁹³ in most cases, however, the bulk of the information is released at the announcement of the event. Because the market processes information rapidly, it is conventional to expand the window only a short period after the announcement. The current academic standard is to extend the event period to the close of trading on the day after the release of the pertinent information.⁹⁴

For those events that are subject to leakage, defining the beginning of the event window can be problematic. Consider the case of a merger in which the target company is rumored to be "in play" prior to the announcement.⁹⁵ For such a case, the event window should begin prior to the actual merger announcement, perhaps as long as a week or two. Ideally, the first day of the event window corresponding to a merger would be the date on which investors began trading on news about the upcoming merger, regardless of whether the news was based on rumors, inside information, a Schedule 13D filing, or a public announcement that merger talks were in process. In practice, this date is difficult to define and some degree of judgment is required generally based on price and volume movements prior to the merger announcement.

With respect to securities fraud cases, there is substantial variation in the complexity of determining the length of an event window. In some fraud cases, choosing the appropriate event window is straightforward. An example is an insider trading case where the information used by the investor is revealed subsequently in a single public announcement. On the other hand, in many securities fraud cases the relevant information is revealed slowly over time, while during the same period investors receive other, sometimes unrelated, information about the firm(s) in question. In the latter case, it is relatively difficult to choose an appropriate window. The main advice is to carefully identify the exact dates during which the information in question reached the market, and then restrict the window to a short period if possible, generally two or three days around each release of new information.

93. *Id.*

94. This is particularly true when the researcher examines a sample of several occurrences of the same type event, such as a merger announcement, for a single event that is generally the most in a securities fraud case, depending upon market factors, the window often is extended beyond the close of trading the day after the public announcement.

95. See Gregg A. Jarrell & Andreia B. Nielsen, *The Advantages in Acquiring Firms in Tender Offers: Evidence from Three Decades*, 18 *Fin. Mgmt.* 12 (1989) and Lisa K. McWhinney, *An Empirical Analysis of Illegal Insider Trading*, 47 *J. Finance* 1611 (1992). In a discussion of stock price movements prior to major events, Gregg Jarrell and Andreia Nielsen document evidence of substantial stock-price run-up in target firms prior to takeover announcements. This literature shows that insider trading often accounts for a large part of this stock price run-up.

89. For information regarding news releases sent to Dow Jones & Company and their subsequent dissemination and impact upon the stock market, see Mark L. Mitchell & J. David Mulherin, *The Impact of Public Information on the Stock Market* (1993) (unpublished manuscript on file with The Business Lawyer, University of Maryland School of Law) and Robert Thompson et al., *Activities of News About Firms: An Analysis of Firm Specific News Reported in the Wall Street Journal Index*, 23 *J. Finance* 845 (1967).

90. See Mark L. Mitchell & Michael Whidener, *Crash in the Confront: The Role of Market Forces in Promoting Air Travel Safety*, 72 *J. Law & Econ.* 359 (1989).

91. *Id.* at 360.
92. *Id.*

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CALCULATE ABNORMAL STOCK PRICE PERFORMANCE

The next step in the event study is to examine the stock price performance around the event. The goal is to isolate the effect of the event on the contemporaneous stock price movement. Stated differently, the investigator attempts to determine whether the stock price behavior around the event is abnormal. A large abnormal stock price movement occurring at the same time the market receives news about an event suggests that the event caused the abnormal price movement. Furthermore, the link between the event and the price movement is even stronger if there is no other new information reaching the market at the same time that could affect the stock price.

The simplest way to evaluate abnormal stock price performance is to visually examine the stock price movement around the event and assess whether it appears small or large. Of course, the degree to which the stock price movement is small or large depends not only on the absolute value of the movement but also on the movement relative to historical patterns and to contemporaneous overall market movements.

Calculation of Stock Returns

In finance terminology, the change in a stock price over a given period is known as the stock price return. The return is expressed as:

$$r = \frac{P_1 - P_0}{P_0} + \text{DIV}_1/P_0$$

where

P_1 = price at end of period

P_0 = price at beginning of period

DIV_1 = dividend paid during period.

Thus, the return is simply the change in the stock price during the period plus any payout of dividends during the period, relative to the stock price at the beginning of the period.⁹⁷ This discussion focuses on daily stock

96. Researchers often express returns in logarithmic form as

$$r = \ln(P_1/P_0) + (\text{DIV}_1/P_0)$$

or as

$$r = \ln(P_1/P_0) + \text{DIV}_1/P_0$$

The logarithmic return is a continuously compounded return whereas the return described in the text is a simple return. For practical purposes the distinction between these two return measures is relatively minor. One benefit of the logarithmic return method is that in statistical terminology, the transformation makes the distribution of the return closer to a normal distribution, thus improving the validity of statistical testing. For ease of exposition, the simple return measure is focused upon. Further, it is also the case that the simple return measure provides better estimates for divergence patterns.

price returns, which is the standard time interval used in most event studies, although returns can be calculated over any increment of time such as hour or month. In securities fraud litigation, daily stock price returns are typically the appropriate measure. In some cases, an examination of hourly, weekly, or monthly data may be warranted—in such cases, the methodology as described can be applied similarly.

An example of a major event to examine abnormal stock market performance is the Tylenol poisonings of 1982.⁹⁸ On September 30, 1982, Johnson & Johnson, the maker of Tylenol, announced that three people died as the result of ingesting cyanide-laced Tylenol capsules.⁹⁹ Four more deaths were reported within the next two days.¹⁰⁰ The Tylenol poisonings resulted in 125,000 stories in the print media alone—an event unprecedented in American business.

To the extent that investors expected the Tylenol poisonings to reduce future cash flows to the stockholders of Johnson & Johnson, its stock price should have declined in response to the announcement of the poisonings. According to the efficient markets hypothesis, the stock price decline will occur quickly. Correspondingly, the return to Johnson & Johnson stock on September 30, 1982, the day that Johnson & Johnson revealed the Tylenol poisonings, is:

$$-6.50\% = \frac{\$46.125 - \$49.125}{\$49.125}$$

where \$46.125 and \$49.125 are the closing prices on September 29 and 30, respectively.

Calculation of Standard Deviation

A decline of 6.50% on a given day appears quite large, especially for a blue-chip firm such as Johnson & Johnson. It is necessary to perform statistical tests, however, to determine that the 6.50% decline did not occur by chance. One approach is to compare the return to a series of returns over some prior period. The comparison period typically ranges from 100 to 300 trading days. For the Johnson & Johnson example, the trading days for the one-year period ending on September 29, 1982, the day before the public announcement of the poisonings, are used. There are 253 trading days during this period. Interestingly, for only one day during the prior year did Johnson & Johnson's stock move more in absolute value than on September 30, 1982. That day is August 17, 1982 when Johnson & Johnson's stock price increased 7.19%. It so happens that this large positive return is likely due in part to the overall stock market increase of

97. See Mark L. Mitchell, *The Impact of External Parties on Board-News Capital: The 1982 Tylenol Poisonings and Subsequent Cases*, 37 Econ. Inquiry 601 (1999).

98. *Id.* at 601.

99. *Id.*

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4.45% that day.¹⁰⁰ The fact that there is only one return during the one-year period that is of the magnitude of the September 30, 1982 decline suggests this decline is significant.

To assess the significance of the -6.50% return on September 30, 1982, a well-known metric of variation in statistics is relied on, the standard deviation. This metric measures the dispersion in a variable around its mean value. The standard deviation for stock returns is formally expressed as:

$$s = \frac{\sqrt{\sum (r_i - \bar{r})^2}}{N - 1}$$

where \bar{r} is the mean return over the sample period and N is the number of trading days in the sample period. As the formula indicates, the greater the variation around the mean value in the sample, the larger the standard deviation. Suppose for example that all the returns had the same value. In such a case, there would be no dispersion around the mean value and thus the formula would indicate a value of zero. Note that the term $(r_i - \bar{r})$ is squared—the rationale is the magnitude of the deviation of returns from the mean value is what matters, not whether a return is above or below the mean. The division by $N - 1$ adjusts for the number of returns in the sample. The intuition behind the $N - 1$ term is straightforward. If this divisor were not included, the calculated standard deviation would increase in magnitude as the number of returns increased. Thus, the increase in magnitude of total deviations while the denominator keeps track of the number of deviations. In this light, the ratio represents an average deviation between an observation and its mean.

The standard deviation of the daily return for Johnson & Johnson stock during the 253 trading days period prior to the Tylenol poisonings is 1.84%. What can be inferred about the impact of the Tylenol poisonings on Johnson & Johnson's stock price when there was a -6.50% return on September 30, 1982 and the historical daily mean return and standard deviation of Johnson & Johnson's stock is known? The most common way to analyze this question is to consider the statistical significance of the daily return.

Testing the Statistical Significance of a Stock Return

Once a researcher identified an event window and calculated the return during that event window, he or she then can determine the statistical significance of the return. The question is whether the absolute value of the return is large enough so that the researcher can indicate with confidence that the return is relatively unusual. The importance of the his-

100. For discussion of controlling for general market movements, see *infra* text accompanying notes 108-112.

torical average and standard deviation of the daily returns is helpful in making the assertion that a given daily return is different from the typical daily return. There is an additional consideration in this analysis—the role of the normal distribution.

Many statistical tests rely on the assumption that the data of interest is normally distributed. The normal distribution is attractive because it is a good description of a wide variety of random variables including stock returns. In the normal distribution, the values of the variable are distributed symmetrically around the mean value and are not concentrated around extreme values. A normal distribution has the familiar bell-shape.¹⁰¹ Also important is that a variable that is distributed normally can be described by its mean and standard deviation. For example, for a normally distributed random variable, the probability is 68.5% that a randomly selected value will be within one standard deviation of the mean value. Similarly, the probability is 95.5% that a randomly selected value will be within two standard deviations of the mean value. Expressed differently, there is only a 4.5% chance that a randomly selected observation will not fall within two standard deviations of the mean value. Finally, very few observations fall outside the boundary of three standard deviations from the mean value—the probability is 99.7% that a randomly selected observation will lie within three standard deviations of the mean value.

While visual displays of stock returns suggest returns tend to follow a bell-shaped distribution, prior statistical research indicates that they are not distributed precisely normally.¹⁰² Even so, researchers have shown that the normal distribution is an appropriate approximation for event study analyses.¹⁰³ Throughout the remainder of this Article, it is assumed that stock returns actually adhere to the normal distribution so that appropriate hypothesis tests can be constructed to determine whether stock price movements during event windows are statistically significant.

To calculate probability values, the normal distribution must be transformed into the standard normal distribution. A standard normal distribution has a mean value of zero and a standard deviation of one. One can calculate z-statistics with this standard distribution—the z-statistic is expressed as:

$$z\text{-statistic} = (\text{observed value} - \text{mean value}) / \text{standard deviation}.$$

Most standard statistics texts include a table of the cumulative standard normal distribution.¹⁰⁴ The table reports for various values of the z-statistic

101. See generally LUKAN OTT, AN INTRODUCTION TO STATISTICAL METHODS AND DATA ANALYSIS 646 (1988).

102. See Eugene F. Fama, *The Behavior of Stock Market Prices*, 38 J. BUSINESS 34 (1965).

103. See Johnson & Warner, *supra* note 85, for a detailed explanation of the distribution of stock returns. Stephen Brown and Jerrold Warner state that "the non-normality of daily returns has no obvious impact on event study methodologies." 34, at 25.

104. See generally OTT, *supra* note 101.

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the probability that a z of that value or greater will occur. The researcher usually will convert an observation drawn from a normal distribution into a z -value in order to assess the significance of that value. The methodology discussed in the previous paragraph is phrased more formally in terms of hypothesis testing. In general, a test of significance aims to answer the question of whether an observed difference is real or simply occurred by chance. In statistical tests, the researcher usually sets out a null hypothesis which states that an observed difference occurred by chance. If the null hypothesis is rejected because a test statistic (such as a z -statistic) is greater than a specified value, then it is unlikely the difference occurred by chance. This result often is called a finding of statistical significance.

For example, researchers apply decision rules to determine whether a given value is significantly different from the mean value. An often used convention is the five percent rule—values greater than or equal to 1.96 standard deviations from the mean value are considered significantly different from the typical value because there is only a five percent chance that a randomly selected value will be 1.96 or more standard deviations from the true mean. Thus, if the calculated z -statistic has an absolute value of 1.96 or greater, the observed value could be considered significant at the five percent level. The decision rule may be more stringent. For example, there is only about a one percent likelihood that a randomly selected value will be outside 2.58 standard deviations or more from the average value. Thus, if the z -statistic is greater than or equal to 2.58, the observed value can be considered significant. A third commonly used decision rule is ten percent—here, the probability is ten percent that a randomly selected value will lie 1.65 standard deviations or more from the mean value. Generally, researchers use a decision rule based on one percent, five percent, or ten percent significance levels.

Stock returns provide a good example of a test of whether an observation is significantly different from the mean. In the case of daily stock returns, the mean daily return is very close to zero; the mean annual return on the stock market over the past thirty years was roughly twelve percent with a corresponding mean daily return of 0.045%. Because the daily return is so small, it is assumed that it is zero for statistical tests and thus a test of whether a daily stock return is different from the mean is just a test of whether a daily return is different from zero. Therefore, the z -statistic simply the daily return divided by the standard deviation. If the result is 1.96 or greater (based on a decision rule of five percent), the results indicate the daily return is significantly different from the mean return. In an article published in the *Virginia Law Review* in 1991, the authors (with Jonathan R. Macey and Geoffrey P. Miller) provided guidelines as to the magnitudes of daily stock price returns that are statistically different

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from zero. For the stocks of the largest equity-value New York Exchange (NYSE) listed firms, a stock price movement of 2.80% might be considered significantly different from zero at the five percent level. In contrast, for the smallest equity-value NASDAQ firms, the necessary price movement to be considered significant at the five percent level is 10.02%. Therefore, because stock price volatility varies widely across firms, inferences about the significance of a firm's stock returns are made with respect to a comparison with that stock's own return history.

Statistical tests of significance are useful both in establishing materiality and in calculating disgorgement. A finding that a stock return associated with the release of information is large enough that it is unlikely that the return occurred by chance is strong evidence that the information was important. Therefore, if that information was used allegedly in securities fraud, the finding that the associated stock return is large enough to be statistically significant implies the information is material. Furthermore, a finding of statistical significance for stock returns data used in calculations of disgorgement is an indication that the estimates are accurate.

For example, suppose a firm's stock price increases seven percent on the day that management releases a favorable earnings announcement. Suppose, also, that the prior day an insider of the firm purchased stock based on his or her knowledge of the forthcoming announcement. The insider subsequently is charged with illegal insider trading. A finding that the seven percent return on the earnings announcement day is statistically significant is strong empirical evidence that the news was important. Stated differently, it is unlikely that the seven percent increase in the stock price occurred by chance. Furthermore, in calculating profits for disgorgement based on the stock price increase on the announcement day, if the return is statistically significant, then a more credible argument can be made that the seven percent return represents the value of the defendant's inside information.

Returning to the Johnson & Johnson example, recall that the standard deviation during the year prior to the poisonings was 1.84%. Dividing the return to Johnson & Johnson stock of -6.50% by this standard deviation yields a z -statistic of 3.53. It is highly improbable that a randomly selected return from Johnson & Johnson's return history would yield a value that is more than 3.53 standard deviations away from zero. Thus, one can claim with a high degree of confidence that Johnson & Johnson's stock price decline on September 30, 1982 did not occur by chance and thus the decline is likely due to the public announcement of the Tylenol poisonings. It is preferable, however, to correct for overall market movements before calculating the significance of abnormal returns.

Net of Market Stock Price Performance

When the market receives new information about the future cash flows of a company, the stock price quickly moves to a new value reflecting the

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new information. Often the information is firm specific in nature, e.g., earnings announcements. In addition, stock prices of individual firms move in conjunction with overall stock market movements that are caused by changes in underlying economy-wide factors. Thus, it is important to account for these marketwide movements, especially during periods when the market is volatile. The best example is the fall of 1997 when market volatility was extremely high around the stock market crash.¹⁰⁶ The basic method for accounting for marketwide factors subtracts the marketwide return from the individual stock's return. This estimate is called the net-of-market return.

Several choices are available as proxies for a marketwide return. Two well known measures are the Dow Jones Industrial Average (DJIA) and the Standard & Poor's 500 Index (S&P 500). The DJIA is limited somewhat as a market index as it contains only thirty stocks and thus large movements in this index often can be driven by changes in just a few stocks. With the S&P 500, this problem is less severe. While the S&P 500 is an acceptable index to proxy for the overall market, this Article uses an even broader measure—an index based on all stocks on the NYSE, American Stock Exchange (ASE), and NASDAQ. This index comes from the Center for Research in Security Prices (CRSP) at the University of Chicago and is one of the more comprehensive indexes available. It should be noted, however, that the S&P 500 is an appropriate proxy as well. Because the correlation between these two indexes is close to one, similar results usually are obtained regardless of the choice of index.

On September 30, 1992 when Johnson & Johnson's stock price dropped 11.50%, the overall market, as proxied by the CRSP value-weighted NYSE, ASE, and NASDAQ index, dropped as well, declining 0.85%. Thus, the net-of-market to Johnson & Johnson stock was -5.51%. As a result, it can be argued that the overall market decline can account for some of the decline in Johnson & Johnson's stock price that day. Even so, the net-of-market return is still quite large.¹⁰⁷ To put this net-of-market return in perspective, it was calculated for the prior 253 trading days. Over this one-year period, a net-of-market return of this magnitude never occurred. The closest in absolute value took place in March 9, 1992, when Johnson & Johnson's net-of-market return was 5.17%. This evidence provides additional support of the notion that the public announcement of the Tylenol poisonings inured a major reevaluation of Johnson & Johnson stock. To test for statistical significance, the standard deviation of Johnson & Johnson's net-of-market returns over the prior 253 trading day period is com-

puted—this sample standard deviation is 1.42%,¹⁰⁸ Thus, the net-of-market return of -5.51% is highly statistically significant as it is many times standard deviations away from a mean return of zero. Stated differently, the z-statistic is 3.95, which is substantially greater than the z-statistic of 2.58 necessary for significance at the one percent level.

Beta-Adjusted Stock Market Performance

Although net-of-market returns, in many cases, provide an appropriate estimate of the stock price effects of new information, there are instances where computation of market-adjusted returns requires a more refined analysis to account for the fact that not all stocks are affected identically by economy-wide factors. That is, the stock returns of some firms move proportionately more than the market in reaction to economy-wide news; the stock returns for some firms track the overall market very closely; and the stock returns of other firms are relatively insensitive to marketwide patterns. The methodology for this adjustment is the market model and requires an estimation of the relation between the stock returns of the individual firm and the returns of the overall market index during a comparison period (also known as the estimation period) which typically precedes the event window. The performance of the firm's stock during the event window is then compared to the predicted performance during the event window. The predicted performance is based on the firm's stock price relationship with the market over the control period.

The first step is to estimate the market model:

$$R_{it} = \alpha_i + \beta_i R_{mt} + \epsilon_{it}$$

which assumes that the return to a stock i at time t is a function of the market return, R_{mt} , plus a random error term, ϵ_{it} , that is uncorrelated with the market return. The market model decomposes the return on a stock into two parts, one part due to factors influencing the market and one part due to variables specifically related to the firm itself. The term β_i , often referred to as beta, measures the sensitivity of a firm's stock returns to overall market returns. Although on average the returns on stocks vary proportionately with the returns on the market index, the returns on individual stocks typically vary more or less than the returns on a market index. For example, a beta of 1.5 indicates that a stock's return (typically increases) ten percent, fifteen percent when the market increases (or decreases) ten percent. Similarly, a beta of 0.5 means that a stock's return typically increases (or decreases) only six percent in conjunction with a ten percent market increase (or decrease). In sum, firms that are relatively

106. For examples of even studies that examined specific announcements during the weekend 1997 stock market crash, see Mitchell & Netter, *supra* note 87 and Jeffrey M. Netter & Mark L. Mitchell, *Stock Returns after Announcements and Insider Transactions After the October 1997 Stock Market Crash*, 14 *Bus. Acc.* 11 (1998).

107. Note that the net-of-market daily return standard deviation of 1.42% is less than the standard deviation (1.84%) of Johnson & Johnson's actual returns over this period. This difference is attributed to the fact that the actual return incorporates marketwide as well as firm-specific factors, and thus is more volatile than the net-of-market return.

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sensitive to market movements (e.g., airlines) typically have betas that are greater than one, highly diversified firms have betas that are close to one, and firms that are relatively insensitive to market movements (e.g., regulated utilities) have betas that are less than one.¹⁰⁹

The market model is estimated with regression analysis. The estimation period for this market model equation typically ranges from 100 to 300 trading days preceding the event under study. That is, the researcher uses the estimates of α and β , and the movement of the market to predict how the stock price of the firm would have changed during the event period, if there were no firm-specific information released during the event period. The difference between the predicted return and the actual return on a given date during the event window is known as the abnormal return. The abnormal return is expressed as:

$$AR_{it} = r_{it} - (\hat{\alpha}_i + \hat{\beta}_i R_{mt})$$

measures the impact of the event on stock i at time t .

As an example, apply the market model to the Tylenol case. To calculate the abnormal return to Johnson & Johnson stock on September 30, 1982, first the market model for the 253 prior trading days is estimated. As in the computation of the net-of-market return, the overall stock market is proxied by the CRSP value-weighted index of NYSE, ASE, and NASDAQ stocks. The estimated beta for Johnson & Johnson for the one-year period prior to the crash was 1.29. A beta of 1.29 suggests that Johnson & Johnson's stock typically increased (or decreased) 12.9% when the overall market increased (or decreased) 10%. The intercept or alpha term is virtually zero as it is only 0.0975%.

The abnormal return on September 30, 1982 to Johnson & Johnson stock is

$$-5.44\% = -6.50\% - 0.1975\% - (1.29 \times -0.89\%),$$

where -6.50% is the actual return to Johnson & Johnson stock, 0.0975% is the estimate of alpha from the market model, 1.29 is Johnson & Johnson's beta estimate and -0.89% is the market return on September 30, 1982.¹¹⁰ Notice the abnormal return of -5.46% is not as negative as the net-of-market return of -5.62% . The net-of-market return approach assumes beta is 1.0, whereas the estimated beta for Johnson & Johnson is 1.29. Thus, more of the decline in Johnson & Johnson's stock price on

109. The term α (i.e., the intercept of the market model, also known as alpha, represents the mean return on the stock when the market return equals zero. Although over time and on average, alpha approximates zero for most companies, it can be significantly different from zero for different intervals.

110. There is a very slight rounding error in these calculations as the calculated abnormal returns are based on parameter estimates and stock returns using five decimal places instead of the two decimal places as indicated for regression purposes throughout the text.

September 30 is accounted for by market factors when it is adjusted. Although the estimated beta is less than one when assuming beta is 1.0.¹¹¹

As before, statistical tests are necessary to estimate the confidence that the abnormal return is different from zero. In computing the significance of the abnormal stock price performance using the actual return and the net-of-market return, these returns simply are compared to the standard deviations of the actual and the net-of-market returns over the prior 253 trading days, respectively. In computing the statistical significance of the abnormal return, however, the significance tests are more complex than in the case of the net-of-market return, yet the intuition is still the same.¹¹² In this case, the researcher estimates the standard error of forecast¹¹³ for the abnormal return as

$$s_e = [s^2(1 + 1/N_e + (R_{mt} - \bar{R}_{mt})^2 / \text{CSSR}_{mt})]^{1/2}$$

where s^2 is the estimated residual variance from the regression model for the estimation period, N_e is the number of trading days in the estimation period, R_{mt} is the estimation period sample mean of the market return, and CSSR_{mt} is the corrected sum of squares of the market return during the event period. This measure is essentially the standard deviation of Johnson & Johnson's returns during the prior 253 trading days accounting for the relation of the returns with the stock market, plus terms to account for the number of observations in the estimation period and overall market deviations on the event date.¹¹⁴ The estimated standard error of forecast for September 30, 1982 is 1.42%.

110. It should be noted that recent works, see Eugene F. Fama & Kenneth R. French, *The Cross-Section of Expected Stock Returns*, 47 J. Finance 483 (1992), and Eugene F. Fama & Kenneth R. French, *Common Risk Factors in the Return on Stocks and Bonds*, 53 J. Fin. Econ. 3 (1993), suggest additional risk factors to the overall market, such as firm size and market/book equity, should be accounted for when calculating abnormal returns. Under certain conditions, in a recursive fraud case in which the information is released over a long period of time, the additional factors may alter the calculation of the abnormal returns. In the Johnson & Johnson example and the cases that follow, however, the Fama and French multifactor model does not alter the results.

111. For recent articles that describe statistical tests in event studies, see Etkhardt Bodnar et al., *Excess-Return Methodology Under Conditions of Event-Induced Volatility*, 30 J. Fin. Econ. 223 (1991) and Bruce Kaminski & David E. Spencer, *Statistical Inference in Modified Event Studies*, 1 Rev. Quantitative Fin. & Accn. 353 (1991). See also supra note 85.

112. The term $s^2(1/N_e)$ is the estimated residual variance from the regression model. The square root of this term is 0.0141 or 1.41% and is simply the standard error of the regression model. Notice that this term is virtually identical to the standard deviation of the net-of-market return over the estimation period. The major distinction is that the standard error from the regression model is a measure of the variation in Johnson & Johnson's return accounting for a more precise relation with the overall market. The first term in brackets is simply 1. The second term, $1/N_e$, accounts for the number of days in the estimation period. The longer the estimation period, the more precisely estimated the market model parameters. This term is generally very small as estimation periods typically range from 100 to 300 days. The third term accounts for large stock market movements on the event date. The larger

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Similar to the prior statistical tests, the abnormal return is compared with the standard error of forecast to determine significance. The abnormal return of -5.46 is nearly four times greater than the standard error—the t -statistic is -3.85 . This indicates that even after accounting for beta, Johnson & Johnson's stock price declined significantly on September 30, 1982, when Johnson & Johnson revealed that Tylenol was laced with cyanide.

Cumulative Abnormal Returns

As noted earlier, event windows can extend beyond one trading day. For these cases, the abnormal returns can be cumulated to create the cumulative abnormal return formally expressed as

$$CAR_T = \sum_{t=1}^T (1 + AR_t) - 1$$

where T is the length of the event window.¹¹ The CAR measures the total impact of the event on the firm. Generally, event studies report both the AR and CAR over the event window. For event windows where the information was released over several days, the CAR often is emphasized. Analogously, simple returns and net-of-market returns can be cumulated as well.

Again, the Tylenol example illustrates measuring abnormal performance over multiple periods. A ten-day event window is constructed, covering the period from September 30 through October 13, 1982. Table 1 reports the cumulative measures of Johnson & Johnson's stock price performance over this ten-day period in Panels A-C, respectively. In Panel A displays the actual returns performance, Panel B displays the net-of-market returns performance, and Panel C displays the abnormal returns performance.

The absolute value of the overall stock market movement on the event date, the larger the return, and hence the larger the standard error of forecast. (Standard for example the market return on 10/1/82 when the overall stock market fell approximately 20%. An abnormal return of 4% on this day would be less significant than an abnormal return of 4% on a day when the market was flat. In general, the second two terms are very small. For example on September 30, the sum of the three terms in brackets was 1.008, resulting in a standard error of forecast of 1.42%.

11.4. Furthermore, cumulative abnormal returns would appear to be simply the sum of the abnormal returns over the event window that is much smaller for the case for logarithmic returns. The problem with a simple summation of the abnormal returns is that the base in the calculation changes from day to day. Therefore, the sum of abnormal returns does not yield a holding period return. Note that the product of $(1 + AR_t)$ over the event period is equal to holding period return. Since the product of $(1 + AR_t)$ over the event period is equal to holding period return, the abnormal returns, in this case, can be calculated as the net return from 34 to 35 (AR = 25%) on one day and then back to 34 (AR = 25%) the next day. Summing the abnormal returns would yield a value of 5%, yet the holding period return is zero, taking the product of $(1 + .25)$ and $(1 + -.25)$ yields the correct cumulative return of zero.

11.5. See *infra* Table 1.

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To illustrate the cumulation technique, consider the actual return on September 30 and October 1 of -6.51% and 1.74% , respectively. The cumulative return is given by the product of $(1 - 0.0651) \times (1 + .017) = 1$. Thus, the two-day cumulative return is -4.88% . This process continues throughout the length of the event window. As of the tenth day of the event window, October 13, the cumulative return to Johnson & Johnson stock is -8.94% . Also, as shown in Table 1, there is a t -statistic that corresponds to the cumulative return.¹² With respect to the cumulative return of -8.94% over the ten-day window, the t -statistic is 1.54. As this t -statistic is slightly less than 1.65, the -8.94% cumulative return misses statistical significance at the ten percent level.

The cumulative net-of-market returns in Panel B display strikingly divergent estimates from that of the cumulative return. Here, the cumulative net-of-market return on October 13, 1982 is -18.91% . The reason that the cumulative net-of-market return is considerably more negative than the cumulative return is that there were large overall stock market gains during this two-week period. That is, Johnson & Johnson's stock would have realized even a larger absolute decline in value had the market not increased during this event window. Similar results are revealed in Panel C which shows the cumulative abnormal returns, based on the market model estimates. In this case, the cumulative abnormal return is -22.39% by the tenth day following the public announcement of the Tylenol poisonings. Given that Johnson & Johnson's beta exceeds one, its stock price should have outperformed the market over this event window in the absence of the Tylenol poisonings—this fact accentuates the negative cumulative abnormal performance realized by Johnson & Johnson.

The sharply contrasting difference between the returns to Johnson & Johnson and the market-adjusted returns illustrate an important point that is relevant for securities fraud cases. Occasionally, announcements by corporations occur contemporaneous with large overall stock market movements. These market movements must be accounted for to isolate the stock price impact of the firm's announcement. It is then possible to assess the materiality of the information and the value of the information contained in the announcement for diagnostic purposes.

A hypothetical example using the Johnson & Johnson facts shows how it may be important to account for market movements in using financial

11.6. The t -statistic for the cumulative return simply are computed by the square root of the sum of the variances associated with each of the daily returns over the event window. For example, to compute the t -statistic for the cumulative return of -4.88% over the first two days of the event window, the standard error of the forecast for each of the two days is required to obtain the variance for each of these two days. The square root of the sum of the two variances is the standard error for a two-day cumulative return. The reason to convert to variances before summing is that mathematically, variances can be summed whereas standard deviations cannot. Note that the variances are cumulated based on logarithmic returns due to better specified distributional properties.

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economists in securities fraud cases. Suppose an employee of Johnson & Johnson found out at his job on September 30 that there were poisonings. He then either sold stock or bought puts in Johnson & Johnson before the public received any news of the poisonings. In an insider trading case brought against this employee, financial economists could be used to show the information he had was material and to calculate disgorgement. As stated previously, the cumulative abnormal return of -22.39% is much more negative than the cumulative return of -8.94% over the period the news about the poisonings became public. Because the insider's information was about factors that affected Johnson & Johnson's stock price and not the overall market, the cumulative abnormal return is theoretically a better measure of the materiality of the information than the cumulative return. In this case the very large cumulative abnormal return of -22.39% significantly buttresses the claim of materiality.

For the same reason, cumulative abnormal returns are also theoretically a better measure than cumulative returns in calculating profits for disgorgement. Cumulative abnormal returns only measure the impact of firm-specific information, in this case the news about poisonings. In a real sense, the value of the information to the trader is best represented by how the information would have affected the stock price in the absence of any other factors—the cumulative abnormal return. Finally, note that this analysis is even more intuitively appealing if the employee in his trading hedged against overall market movements.

In addition, note the role of statistical tests in this example. The cumulative abnormal return of -22.39% has an associated t -statistic of -4.98 . That t -statistic indicates that the cumulative abnormal return is highly significant—at the one percent level. Therefore, it is very unlikely that the negative cumulative abnormal return occurred by chance, which is strong evidence that the information about the Tylenol poisonings led to the negative cumulative abnormal return. The finding of statistical significance is thus strong evidence the information was material and it buttresses the credibility of disgorgement estimates based on the cumulative abnormal returns.

USE OF FINANCIAL ECONOMICS IN SEC ENFORCEMENT CASES

Two roles for financial economists in securities fraud cases—determining materiality and calculating disgorgement—have been suggested. The event study methodology provides the basis for these two roles. The following five recent SEC cases provide evidence of staff economists participating in the determination of materiality and disgorgement.¹¹⁷

117. Only cases for which relevant information that is established from the SEC's under the Freedom of Information Act are discussed. Cases that would require consideration of any nonpublic information are not discussed. For example, financial economist analyses at the SEC may suggest that potential white neck privet. Such investigations are not mentioned here.

INSIDER TRADING BY AN EXECUTIVE RECRUIT

In September 1986, Artel Communications, a small fiber-optic telecommunications firm traded on NASDAQ, fired its chief executive officer and hired Ingoldby Associates to recruit a replacement. Three months later Ingoldby Associates recommended Robert Bowman for the position, and on February 4, 1987 Artel's board voted to offer the job to Bowman. On the morning of February 9, Artel informed Ingoldby Associates that Bowman accepted. Later that day, Michael O. Ingoldby, president of Ingoldby Associates, purchased 23,500 shares of Artel stock for approximately \$72,000 (average price of \$3.06 per share). Artel announced the appointment the following morning. Reuters Ltd. and Dow Jones News Service reported the appointment at 11:17 a.m. and 4:13 p.m., respectively. In April 1989, the SEC charged Ingoldby with insider trading based on information he misappropriated from Artel.

Table 3 displays Artel's stock market performance during the period surrounding Bowman's appointment.¹¹⁸ Over the two-day period, February 10 (announcement date) and the prior day, Artel's stock price increased from \$2.25 to \$3.75. The abnormal return on the announcement day is 20.53% and is 45.38% on the prior day. The large abnormal return on February 9, the day prior to the announcement, is likely due to trading by Ingoldby and leakage of the information. As noted *supra*, stock prices often move significantly prior to a material announcement as the information leaks out. For example, Ingoldby's purchase of 23,500 shares on the 9th was very large relative to prior days. The average daily number of shares traded for Artel over the prior year was 13,948. Thus, the trades by Ingoldby alone on February 9 exceeded the daily average by 69%. The total trading volume of 72,000 shares on February 9 was more than five times higher than the daily average. His own trades and the fact that he told his broker that an important announcement was about to take place

118. The facts for this case originate from SEC v. Ingoldby, litigation Release No. 12,461, (1990 Transfer Denied) Fed. Sec. L. Rep. (CCH) ¶ 95,331 (May 15, 1989) and Thomas Newlin & Catherine Stock, *Civil Penalties and the Securities and Exchange Commission's Recent July Trial Experiments Under the Insider Trading Sanctions Act*, in *SECURITIES ENFORCEMENT JOURNAL* 289 (FJA Corp. Law & Practice Course Handbook Series No. 741, 1991).

119. Abnormal and cumulative abnormal returns are calculated in the same manner as in the Johnson & Johnson example. To maintain consistency in this Article, in all cases the value-weighted CRSP index of all NYSE, AMEX, and NASDAQ stocks are used as the market proxy. There are instances, however, in the actual cases at the SEC, depending on the facts of the case, that staff economists also used different market indexes as well as industry indexes in the estimates. Likewise, in the financial economist analysis of these cases at the SEC, economists also used several different calculation periods ranging from 100 to 300 days to calculate betas. The purpose was simply to test all alternatives as to how to verify the robustness of the estimates. Here, however, for reasons of simplicity only the results based on the broad-based CRSP index and on estimation periods that cover the 252 days (one year) prior to the event are presented.

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at Artel may have provided signals to other investors that firm-specific information was imminent.

The stock price remained relatively flat until February 18 when it rose to \$4.50 (abnormal return is 20.25%). On this date, a federal holiday, a February 18 article published in *Fiber Optics News* became publicly available. It reported that Bowman would remain a director at Telco Systems where he previously was chairman.¹²⁰ *Fiber Optics News* indicated considerable potential for synergies between the two firms as they were direct competitors.¹²¹ The only other large stock price movement in February occurred towards the end of the month when Artel's stock dropped roughly 15% on February 25, from \$4.25 to \$3.625. This decline occurred following a *Dow Jones Broadband* story at 6:20 p.m. the prior day reporting fourth-quarter 1986 losses for Artel.

In order to prove insider trading, the SEC must establish that the investor possessed material, nonpublic information.¹²² For this case, two factors warranted the use of financial econometrics in establishing materiality—the relative importance of a management appointment and the fact that Artel was a thinly-traded stock. First, would a reasonable investor consider a managerial appointment important? The majority of insider trading cases involve corporate control transactions where a large price movement generally occurs. This is not the case with managerial appointments, however, as empirical studies indicate a small, positive return at the announcement of top management appointments.¹²³ Poorly managed firms¹²⁴ or firms in financial distress¹²⁵ exhibit larger returns, but at most the average abnormal return is only about three percent. These studies, however, indicate substantial variation across the abnormal returns and thus the stock price movement associated with the Bowman announcement is not incompatible with the paradigmatic evidence.¹²⁶

The second step in establishing materiality is the significance of the price movement. As indicated in the Artel example, the positive abnormal re-

120. *Business Lawyer* (Chairman, 120) of Artel Communication, *Fiber Optics News*, Feb. 16, 1987, at 1.

121. *Id.*

122. See generally *Mills v. FBI*, 403 U.S. 810 (1963); *Clement v. United States*, 419 U.S. 572 (1974).

123. See Eugene F. Fama, *Market, Corporate Control, and Shareholder Wealth*, 12 *J. Finance* 391 (1957); A. Jensen & M. M. Meuhls, *Corporate Control and Shareholder Wealth*, 12 *J. Finance* 391 (1957).

124. See Michael R. Wachter, *Financial Distress and 1970 Earnings*, 20 *J. Fin. Econ.* 433 (1988).

125. See Karl-Ludwig Bönning & Rüdiger F. Hansen, *An Analysis of Stock Price Reaction to Management Changes in Distressed Firms*, 11 *J. Appl. Corp. Fin.* 55 (1998).

126. According to the review article by Eugene F. Fama, Jensen and M. M. Meuhls, *Market, Corporate Control, and Shareholder Wealth*, 12 *J. Finance* 391 (1957), it is likely the stock price reaction is larger for NASDAQ firms, especially small ones such as Artel, which had an equity value of only about \$5 million prior to the announcement, because managerial capital is

greater in firms with a greater proportion of total value in smaller firms.

turn are very large on the announcement day, February 10, and 11 day, as well as February 18 in conjunction to test for statistical significance because Artel is a thinly-traded stock. For example, during 1986 the daily average trading volume for Artel's stock was only 25% of the average daily trading volume for the average NASDAQ stock and only about 5% of the average daily trading volume for all publicly traded stocks. As noted *supra*, small stocks are considerably more volatile than large stocks—thus, the abnormal returns must be larger before a given abnormal return can be considered significantly different from zero. This general fact is true for Artel as well. For example, the standard deviation of Artel's stock returns over the prior one-year period is 5.57%. Thus, for a given day, Artel's stock return must be about 11% before significance can be asserted. In contrast, recall from the Tylenol example that the standard deviation of Johnson & Johnson's return was 1.84%. Here, for this large NYSE firm that exhibits less volatile price movements, significance on a given day can be asserted with a much smaller stock price movement.

In spite of the fact that Artel's stock price is very volatile, the abnormal return on the announcement day, February 10, the prior day, and February 18 (associated with the *Fiber Optics News* article), the positive abnormal returns are highly statistically significant largely because of the magnitude of these abnormal returns.

Even though the abnormal returns are statistically significant around the information release dates, trading volume also is very high on these dates. It is possible that the high trading volume might have created temporary price pressure on Artel stock. The stock price, however, remains stable until the negative earnings announcement at the end of the month, buttressing the SEC's establishment of materiality. Furthermore, the cumulative abnormal return remains significant at the five percent level throughout the entire month.

This analysis suggests that Ingoldby could have profited from the inside information, thus warranting disgorgement. Ingoldby purchased 23,400 shares for \$72,000 (average price of \$3.06). On February 24, Ingoldby sold 9000 shares at \$4.125 and one day later he sold 1000 at \$3.875. He then held on to the remaining 19,500 shares until the spring of 1989 when he sold at an average price of \$2.00. Thus, Ingoldby realized actual losses of about \$17,000 on his investment based on inside information. As noted *supra*, however, paper profits, not actual profits, theoretically provide a better benchmark with which to calculate disgorgement.

In calculating paper profits, the full information price is the first date when Artel's stock price fully reflected the information regarding the Bowman hiring. While most of the price reaction occurred at the announcement, Artel's price also increased significantly one week later subsequent

127. See *supra* text accompanying note 55.

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to the *Fiber Optics News* story which noted that Brownian would "rethink" combinations between the two competitors. If Ingoldby knew that Brownian would remain a director at Telcel, then the full information price would reflect the February 18 price increase. The SEC argued that the full information price extend out to February 18 to reflect the price impact of the *Fiber Optics News* story.¹²⁸ In contrast, Ingoldby claimed the court should follow the standard set by *Traxx Gulf Shrimp* and base disgorgement on the closing price the day after the announcement.¹²⁹ Thus, he argued for a full information disgorgement price of \$3.75, the closing price on February 11.¹³⁰

The court accepted the SEC's argument and held that the full information price was \$4.50, the closing price on February 18.¹³¹ The court calculated disgorgement at \$24,663, accounting for commission costs (\$0.10 per share), bid ask spread (\$0.25 per share), and other factors.¹³² Thus, while Ingoldby actually lost money on his transactions, he was required to disgorge the paper profits realized from his trading. In outlining its decision, the court stated:

Arvid was a relatively small company with limited media attention and exposure. Although a story regarding the new Arvid president ran in the Wall Street Journal on February 11, 1987, I find that the news was not fully disseminated, absorbed and digested by the investing public until after the Brownian articles appeared in the *Fiber Optics* trade publications.¹³³

In sum, this case illustrates the application of financial economics in an insider trading action. The event study technique is applied to show that information about a pending managerial appointment is material. Additionally, the event study analysis is used to calculate the value of inside information for disgorgement calculations.

128. The SEC and the court cited the *Alcedo* case as precedent for extending the event window a few days beyond the date of the original announcement. SEC v. Ingoldby, Litigation Release No. 12,701, (1986 Transfer Market Unit, Sec. L, Rep. (XIII) 195,351, 95-034-03 (May 15, 1994). Despite the apparent similarities between the two cases, however, the arguments for a longer window in this case (that it was in *Alcedo*). As previously discussed, there are two problems with the district court's reasoning in the *Alcedo* case. First, in *Alcedo* the follow-up *Wall Street Journal* story was unrelated to the information in which Alcedo made its announcement. Second, the overall stock market increased a great deal during the long event window used in *Alcedo*, both of these factors are directly related to the *Ingoldby* case. In *Ingoldby*, the subsequent *Fiber Optics News* story is directly related to Ingoldby's inside information. Also, there were no market swings during the long window in *Ingoldby* that could have caused the significant increase in Arvid's stock price.

129. *Id.* at 96,894-915.

130. *Id.* at 96,895.

131. *Id.*

132. *Id.*

133. *Id.*

OFFICER OF ACQUIRER SELLS TARGET STOCK BUYS CALL OPTIONS IN ACQUIRER¹³⁴

On March 9, 1987, Robert Slattery, divisional vice president of Reebok International, purchased Reebok call options and sold stock of Avia Group International. On the following day, Reebok announced an agreement to acquire Avia in a move to expand market share in the athletic shoe industry. In September 1988, the SEC charged Slattery with trading on the basis of inside information.

On February 11, 1987, one month prior to his alleged insider trading, Slattery purchased 1000 shares in Avia at \$19 per share.¹³⁵ Coincidentally, twelve days later, at a Reebok executive meeting, Slattery learned of Reebok's interest in acquiring Avia at about \$16 a share. For the next two weeks, Reebok and Avia officials engaged in merger negotiations, culminating in Reebok's announcement of the acquisition on March 10. During this period, Slattery participated in Reebok's investigation of Avia's facilities. On the day before the merger announcement, Slattery sold his 1000 shares of Avia stock at \$26 a share. He also purchased twenty March call option contracts on Reebok stock with exercise price \$40 at \$75 per contract and twenty April call option contracts with exercise price \$40 at \$156 per contract.

Table 3 displays the stock and option price performance for Reebok and the stock price performance for Avia during the period surrounding the merger proposal.¹³⁶ On the merger announcement date, March 10, 1987, Reebok's stock price increased from \$37.50 to \$41.75. The stock market impact of the merger proposal occurred largely on the announcement day as Reebok's stock price did not move very much on any of the days surrounding the announcement. Because Slattery purchased Reebok calls, Table 3 also displays Reebok option prices for March 40 calls and for April 40 calls. In both cases, the price of the calls increased greatly on March 10: the March 40 calls increased from \$0.6125 to \$2.50 and the April 40 calls increased from \$1.875 to \$4.125.

The primary issue in this case concerned the establishment of materiality.¹³⁷ This issue is especially important here because Slattery's trading pattern before the announcement—sell shares in the target and buy calls in the acquirer—is unprofitable in a typical merger. Thus Slattery may argue that his trading behavior could not have been based on information regarding a subsequent merger announcement as it is well known that the stock price of the target almost always increases upon acquisition an-

134. The facts of the case originate from SEC v. Slattery, Litigation Release No. 11,858, 1988 SEC LEXIS 1758 (Sept. 2, 1988).

135. The SEC did not charge Slattery with buying the Avia stock based on inside information, only the subsequent sale of Avia shares was considered illegal. *Id.*

136. See *infra* Table 3.

137. See, e.g., 1988 SEC LEXIS 1758.

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nonmovement. Furthermore, some financial economists documented that the average stock price reaction to acquiring firms for acquisition announcements during the 1980s was negative.¹⁴³

While the average announcement-period return may have been negative for some samples and close to zero for most studies, large price increases for the acquiring firm are not that uncommon. In a study of 401 acquisitions during 1982-86, (Average Abnormal Return = -0.08%, t-statistic = -0.45), however, Mark L. Mitchell and Kenneth Lehn found that in 51 of the acquisitions, the stock price of the acquiring firm increased more than five percent during a three-day window surrounding the announcement.¹⁴⁴ Furthermore, researchers recently documented positive stock price reactions to acquirers when the merging firms operate in the same line of business.¹⁴⁵

Moreover, as displayed in Table 3, the Reebok abnormal return of 9.90% on March 10, (the announcement day, is statistically significant at the one percent level (t-statistic is 2.80). For the ten trading days surrounding the announcement, none of the abnormal returns are statistically different from zero, indicating that there was little leakage prior to the merger announcement and that the initial price reaction on March 10 captured the full impact of the announcement (notice that the cumulative abnormal returns fairly steady after March 10). The combination of the large stock price and option price movement for Reebok on the day of the merger announcement and the prior empirical evidence suggests Slattery possessed material, non-public information.

Further evidence that Slattery had material information comes from the fact that he sold Avia stock the day before the announcement, and Avia's stock price fell from \$25 to \$17.25 on the announcement day. This stock price decline contrasts sharply with the large, positive price reaction that almost always occurs with target firms, and illustrates the facts of this merger are unique. Insiders and venture capitalists owned most of the stock in Avia. While Avia never went public, roughly 800,000 converted debentures (about eight percent of the common stock) from a 1981 financing traded in the "pink sheet" over-the-counter market. Prior to the Reebok merger offer, it was known publicly that Avia was in the process of planning a public offering at \$11 to \$14 a share. As Table 3 indicates, investors in the small pink sheet market for Avia stock anticipated that the price after the public offering would rise well above the \$11 to \$14 range.

143. See Jarrrell & Poulsen, *supra* note 93; Mitchell Bradley et al., *Synthetic Gains from Corporate Acquisitions and Their Relation Between the Stockholders of Target and Acquiring Firms*, 21 J. Fin. Econ. 3 (1988).

144. Mark L. Mitchell & Kenneth Lehn, *The Deal Makers: How They Operate*, 98 J. Fin. Econ. 379 (1990).

145. See Neil W. Siekman & Richard H. Peeway, *Acquisition of Divided Asset and Shareholder Wealth*, 42 J. Finance 1251 (1987); Randall Munn et al., *On Managerial Objectives Under Pool Agreements*, 4th J. Financial 51 (1990).

Consequently, when Reebok announced the merger pact with Avia at a price of \$16.50, the share price of Avia fell simply from \$25 to \$17.25. Therefore, Slattery's trades that on the surface appear surprising were actually predictably profitable. He bought his 1000 shares of Avia a month earlier at \$19 a share. By the day of his trades (March 9), Slattery knew that Reebok's merger was likely to go forward. Consequently, he had material information given that Avia's stock price was trading at about \$25 rather than \$16.35. The 31% decline in Avia's price in the pink sheet market suggested a material price change even for a stock with thin trading. Disorgement calculation is simple in this case because Slattery's security transactions clustered around the announcement date. For the Reebok call option, the SEC computed the difference between the purchase price on March 9 and the sale price on March 10, adjusting for commission costs.¹⁴⁶ For the sale of the Avia stock on March 9, the SEC computed disgorgement as the difference between the price of \$26 at which he sold the 1000 shares on March 9 and the closing price of \$16.50 on March 10.¹⁴⁷ The merger announcement date, applying the arguments of the efficient markets hypothesis that stock price rapidly adjusts to the release of new information,¹⁴⁸ Neither admitting or denying the allegations, Slattery agreed to settle with the SEC by disgorging profits of \$11,129 and paying a penalty of the same amount.¹⁴⁹

DELINQUENT SCHEDULE 13D FILINGS

On December 18, 1987, Francis Spillman, president of Pizza Inn, bought 50,000 shares of a chain of chicken restaurants called Winners Corporation, increasing his stake from 4.31% to 5.56%. Because Spillman crossed the five percent threshold with this purchase, SEC rules required him to file a Schedule 13D within ten calendar days, reporting his ownership stake and intention for Winners.¹⁵⁰ Spillman, however, did not file a Schedule 13D until January 6, eight days later than required. During the period between the required filing date and the actual date of filing (December 29 through January 5), Spillman bought an additional 45,000 shares increasing his stake to 6.9%. When Spillman filed the Schedule 13D on January 6 reporting the 6.9% stake, he also revealed a tender offer consideration at \$4.25 per share for the remainder of the stock. Winners

141. Slattery, 1988 SEC LEXIS 1238.

142. *Id.* The March 10 closing price of \$16.50 used in disgorgement differs from the price given in Table 3, as the latter price is the daily average of the bid and ask prices.

143. *Id.*

144. *Id.*

145. The facts of the case originate from SEC v. Spillman, Litigation Release No. 12,721, 1989 SEC LEXIS 2584 (Dec. 13, 1989).

146. 17 C.F.R. § 340.13d-1(d), -2(d) (1993). During the ten days following December 18, Spillman purchased an additional 10,500 shares.

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rejected the potential offer, and three months later Spillman became the owner of the stock.

In December 1989, the SEC charged Spillman with violating section 13(d) of the Exchange Act.¹⁴⁷ Specifically, the SEC argued that during the period from December 29, 1987 to January 5, 1988, Spillman purchased Winner's stock at prices that did not reflect the information that should have been reported in the Schedule 13D.¹⁴⁸ Academic research in 1985 supports this argument;¹⁴⁹ these studies document significant, positive price reactions to announcements of Schedule 13D filings. The SEC sought disgorgement of the savings Spillman realized in purchasing the 45,000 shares from December 29 to January 5.¹⁵⁰

As noted *supra*, the SEC first sought disgorgement for Schedule 13D violations in *First City* where the court required disgorgement of the actual profits.¹⁵¹ The court used actual profit, which it recognized were only a reasonable approximation of the "ill-gotten gain," because they were easy to calculate—the difference between the price the defendants received when they sold their stock back to the corporation and the price they paid for the stock.¹⁵² In *First City* the defendants sold their stock shortly after the 13D filing so that the paper profits were similar to the actual profits. In this case, however, actual profits might not be a reasonable approximation of the paper profits from the late filing because Spillman waited three months before beginning to sell some of his shares.

Table 4 displays the stock price performance for Winners for December 11, 1987 through January 22, 1988.¹⁵³ Table 4 also reports the ratio of daily volume to the mean volume over the prior year in Winner's stock and the ratio of the volume accounted for by Spillman to the mean volume over the prior year. Table 4 shows Winner's stock price rose during the period when Spillman was purchasing large numbers of Winner's shares, before filing the required Schedule 13D. Specifically, from December 11 through January 5 the cumulative Abnormal Return for Winner's stock was roughly 70% a period during which Spillman accounted for 45.5% of the trading volume. For example on December 16, when Spillman purchased 107,500 shares (accounting for all but 3000 shares traded that day), Winner's price increased from \$1.375 to \$1.50, and on December 18, when Spillman purchased 50,000 shares (accounting for 42% of shares traded), Winner's price increased from \$1.50 to \$2.25. Besides accounting for a substantial amount of the trading volume on these days, the volume of Spillman's trades often exceeded historical volume. For example, on

December 16, Spillman's volume was 12.2 times greater than the average daily volume over the prior year.

An argument that Spillman should not be required to disgorge any profits from the late Schedule 13D filing rests on the observation he simply could have purchased the 45,000 shares during the ten-day period after crossing the five percent threshold but before the required filing date (that is, by December 28). The stock price evidence, however, suggests Spillman could not have purchased the 45,000 shares in this period without increasing the market price. Therefore, it is likely that, to the extent that the late Schedule 13D filing enabled Spillman to spread his purchases over a longer period, he was able to buy shares more cheaply; otherwise he would have purchased them during the authorized time period.

The disgorgement issue focuses on the determination of the price that Spillman would have had to pay for the 45,000 shares purchased from December 29 through January 5 had he filed on December 28, as required, rather than January 6. On January 6 when Spillman announced his Schedule 13D filing, Winner's stock price increased from \$2.50 to \$3.00 (abnormal return = 19.98%, *t*-statistic = 3.72). Thus, one could argue that if Spillman filed on December 28, Winner's stock price would have closed at \$3.00 rather than \$1.875 (actual closing price on December 28th and 29th).¹⁵⁴ Accordingly, Spillman should disgorge the difference between the price he paid for the 45,000 shares and \$3.00.

Winner's stock price performance after the Schedule 13D filing suggests, however, that \$3.00 may be too high a price to use for disgorgement. While the price increased from \$2.50 to \$3.00 on January 6, the date of the 13D filing announcement, it began to fall two days later. The decline in the stock price suggests the \$3.00 price partly reflected the market overestimating the probability of a successful tender offer. Furthermore, the data in Table 4 indicate that the market reacted to Spillman's under proportion of the total volume and his large purchases likely led to price pressure, as evidenced by the fact that the price increased on those days in which he made relatively large purchases. In addition, in almost all cases Spillman made his purchases at the high price of the day, likely due to his large share amounts.

Consequently, the SEC based the price that Spillman should have paid for the 45,000 shares on the estimated price at which he could have sold these shares following the Schedule 13D filing. As argued *supra*, it is unlikely that Spillman could have sold the shares for \$3.00 because Winner's

¹⁴⁷ 15 U.S.C. § 78n(d) (1988).
¹⁴⁸ *Spillman*, 1989 SEC LEXIS 2284.
¹⁴⁹ See *supra* note 73.
¹⁵⁰ *Spillman*, 1989 SEC LEXIS 2284.
¹⁵¹ See *supra* text accompanying notes 74-82.
¹⁵² SEC v. *First City Fin. Corp.*, 850 F.2d 1215, 1231 (D.C. Cir. 1989).
¹⁵³ See *infra* Table 4.
¹⁵⁴ It could be argued that had Spillman filed on December 28, Winner's stock price would not have risen fully to \$3.00, because the \$3.00 closing price on January 6 reflected the purchases of the 45,000 shares during the period December 29 to January 5. Indeed, as discussed *supra*, however, this is evidence of a relation between the size of the purchase by an investor filing a Schedule 13D and the stock price reaction. See Hochstetern & Schemm, *supra* note 73, at 565.

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stock was thinly traded and Spillman's purchases often accounted for a large amount of the trading volume. Thus, the SEC used the average price (\$2.675) over the two-week period following the Schedule 13D filing as a basis for disgorgement calculation, under the assumption that he could have sold his shares over this longer period without having a large market impact. Spillman agreed to a permanent injunction against further violations and paid disgorgement of roughly \$24,000, without admitting or denying the allegations.¹⁵⁵

CHAIRMAN LEAKS PRIVATE INFORMATION TO ANALYSTS¹⁵⁶

On May 15, 1987, Ultrascience Corporation announced lower earnings than expected for the first quarter of 1987. The day before, Philip J. Stevens, founder and chairman of Ultrascience, called several analysts who followed Ultrascience and informed them of the bad news. The analysts in turn advised their clients who then sold the stock that day and the following morning prior to the announcement at 3:14 p.m. In March 1991, the SEC charged Stevens with violation of insider trading by providing the negative information to select analysts in advance of the press release.¹⁵⁷ On May 15, the day of the press release, the price of Ultrascience's stock dropped about eight percent (negative abnormal return of roughly seven percent), a decline that was statistically significant. In the typical insider trading case, the establishment of materiality relies partly on the stock price reaction at the announcement of the information. This case is unique because Ultrascience's stock price did not move very much subsequent to the 3:14 p.m. announcement on May 15, thus putting into question the materiality of the information. Instead almost all of the statistically significant abnormal price decline on May 15 occurred by 10:15 a.m. The plaintiff admitted price decline on May 15 occurred by 10:15 a.m. However, price fell during the first few minutes of trading on May 15, however, occurred just after large sell orders from the analysts' clients, thus indicating materiality. In this case, the stock market just responded to the negative information hours prior to its official actual release rather than afterwards.¹⁵⁸ Neither admitting nor denying the insider trading allega-

tion, Stevens settled with the SEC by disgorging more than \$20,000 based on the losses the analysts' clients avoided by selling the stock prior to the announcement.¹⁵⁹

CORPORATE RAIDER SELLS STOCK IN TARGET FIRM IMMEDIATELY FOLLOWING TAKEOVER BID¹⁶⁰

On February 29, 1988, Mesa Limited Partnership, of which T. Boone Peters Jr. is the general partner, publicly announced a 3.8% stake in Homestake Mining and offered to acquire the remaining shares at \$20 a share. Upon this announcement, Homestake's stock price jumped from \$14 to \$18. That same day, Mesa began selling its stock in Homestake as well as some call options. Mesa continued to sell shares in Homestake for the next several days without issuing a press release informing the public of its sale transactions. In September 1990, the SEC charged Mesa with negligence without fraudulent intent.¹⁶¹

The SEC claimed Mesa's February 29 press release was misleading because it did not reveal Mesa's intentions to sell shares in Homestake, enabling Mesa to sell Homestake stock at inflated prices. The primary issue was whether Mesa's initial reporting of the ownership stake can be considered material, aside from the offer to acquire the remaining shares of Homestake. If the 3.8% ownership disclosure is material, then the decision to sell the stake is also likely a material event and hence should be disclosed promptly.¹⁶²

As stated earlier, the announcement of a Schedule 13D filing generally results in a significant, positive stock price change. Hence, the disclosure of ownership stakes is typically material. Furthermore, an examination of Mesa's prior announcements of ownership stakes in various corporations indicates a large, positive stock price reaction. This suggests that investors considered the announcement of the 3.8% stake in Homestake to be material. Thus, the decision not to disclose promptly the sale of the stake can be considered material as well. Mesa settled with the SEC without

¹⁵⁵ Stevens, 1991 SEC LEXIS 451.

¹⁵⁶ The facts of the case originate from SEC v. Skema Ltd. Partnership and T. Boone Peters, Litigation Reference No. 12,617, 11990 Transfer Binder | Fed. Sec. L. Rep. (CCH) ¶93,492 (Sept. 27, 1990).

¹⁵⁷ Id. at ¶93,572.

¹⁵⁸ An argument could be made that Mesa sold the stake to hedge its investment in Homestake by "divesting potentially large losses in the event of market profit reversals. There are a few historical cases involving this strategy. For example, in 1989 when Alfred Caheril acquired NYK, he sold more than half of a 4.5% stake in NYK at a time when it still was not certain that the acquisition would go forward. The explanation was his intention to use the proceeds of the sale to pay the merger proposal expenses. See Caheril Cal NYK Stake in 1989, *Filing Folder*, Wall St. J., June 26, 1989, at C3.

¹⁵⁹ SEC v. Spillman, Litigation Reference No. 12,321, 1989 SEC LEXIS 2384 (Dec. 13, 1990).

¹⁶⁰ The facts of the case originate from SEC v. Stevens, Litigation Reference No. 12,813, 1991 SEC LEXIS 451 (Mar. 15, 1991).

¹⁶¹ Id. This case is the first in which the SEC charged that a corporate insider who disclosed trading news by providing material information to analysts. While the analysis did not involve trading in the insider's securities, the SEC argued that Stevens benefited by enhancing his reputation among analysts. Mr. Stevens' reputation recently was tarnished as a result of his culpability in the insider trading case involving Ultrascience.

¹⁶² See also *SEC v. Skema Ltd. Partnership*, supra note 156, for an explicit analysis of insider trading cases. The court stated that the SEC's position was not material to the market as a result of insider trading. Id. at 1173.

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admitting or denying the allegation by disavowing \$2.8 million in the firm's sales of Homebase stock.¹⁰⁸

SUMMARY

Modern financial economics is becoming increasingly influential in securities fraud law. The efficient markets hypothesis has provided a framework for the analysis of certain questions and a basis for generating empirical evidence on the value of information in individual cases. Clearly, there are certain areas of securities law where the efficient markets hypothesis continues to have an impact. Of particular importance is an empirical technique derived from the efficient markets hypothesis—the event study. Event studies are useful to establish, among other things, materiality and calculate damages in securities fraud litigation. Event study analysis already was applied in five SEC enforcement actions.

There are many areas in securities fraud litigation where empirical techniques from financial economics may be useful. Indeed, event study techniques potentially are much more valuable than described in this Article. Event study analysis is useful at all stages of litigation to both defendants and plaintiffs. The analysis is applicable, not just in SEC insider trading cases, but in all types of securities fraud actions, including private suits. Furthermore, by providing objective, relatively precise measures of the importance of information and of illegal profits or damages, the importance of financial economics in securities fraud litigation will continue to increase.

108. *Alone Ltd. Partnership*, [1990 Transfer Binder] Fed. Sec. L. Rep. (CCH) at 95,573.

TABLE 1
Stock Price Performance for Johnson & Johnson
Following the 1982 Tylenol Poisonings

Date	Stock Price	Cumulative			
		Return	Z-statistic	Return	Z-statistic
Sept. 29	46.125	-6.51	-3.55	-6.51	-3.55
Sept. 30	43.125	1.74	0.95	-4.88	-1.88
Oct. 1	43.875	-5.98	-3.29	-10.57	-3.79
Oct. 4	41.250	-5.46	-2.97	-15.46	-4.21
Oct. 5	39.000	7.05	3.84	-9.49	-2.31
Oct. 6	41.750	-3.29	-1.80	-12.47	-2.77
Oct. 7	40.375	5.57	3.04	-7.59	-1.56
Oct. 8	42.625	2.05	1.12	-5.69	-1.10
Oct. 11	43.500	-4.60	-2.51	-10.01	-1.82
Oct. 12	41.500	1.21	0.66	-8.94	-1.54
Oct. 13	42.000				

Panel B: Net-of-Market Returns Performance					
Date	Stock Price	Net-of-Market Return	Z-statistic	Cumulative Net-of-Market Return	Z-statistic
Sept. 29	46.125	-5.62	-3.95	-5.62	-3.95
Sept. 30	43.125	0.34	0.36	-5.11	-2.54
Oct. 1	43.875	-5.74	-4.03	-10.56	-4.28
Oct. 4	41.250	-5.88	-4.18	-15.82	-5.50
Oct. 5	39.000	3.96	2.78	-12.48	-3.92
Oct. 6	41.750	-5.45	-3.63	-17.25	-4.95
Oct. 7	40.375	3.77	2.65	-14.13	-3.75
Oct. 8	42.625	-0.36	-0.25	-14.41	-3.58
Oct. 11	43.500	-4.61	-3.24	-18.58	-4.30
Oct. 12	41.500	-0.65	-0.45	-18.91	-4.20
Oct. 13	42.000				

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TABLE 1 (continued)
 Stock Price Performance for Johnson & Johnson
 Following the 1982 Tylenol Poisoning

Date	Stock Price	Abnormal Return Performance		Cumulative	
		Abnormal Return	Z-statistic	Abnormal Return	Z-statistic
Sept. 29	46.125	-5.46	-3.85	-5.46	-3.85
Sept. 30	43.125	0.10	0.07	-5.37	-2.87
Oct. 1	43.875	-5.75	-4.07	-10.83	-4.40
Oct. 4	41.250	-6.10	-4.31	-16.27	-5.73
Oct. 5	39.000	2.98	2.06	-13.78	-4.52
Oct. 6	41.750	-6.17	-4.31	-19.10	-5.47
Oct. 7	40.375	3.16	2.21	-16.54	-4.38
Oct. 8	42.625	-1.15	-0.80	-17.50	-4.33
Oct. 11	43.500	-4.72	-3.33	-21.39	-5.00
Oct. 12	41.500	-1.28	-0.89	-22.39	-4.96
Oct. 13	42.000				

Note: Returns are expressed in percent. Stock price data is from Center for Research in Security Prices (CRSP) at the University of Chicago. Market model estimation period is September 30, 1981 through September 29, 1982. Market proxy is CRSP value-weighted index of NYSE, AMEX, and NASDAQ stocks. Beta estimate for Johnson & Johnson is 1.25.

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TABLE 2
 Stock Price Performance for Artel Communications
 Surrounding the Announcement of Robert Bowman as Chief
 Executive Officer on February 10, 1987

Date	Artel Price	Artel Volume	Abnormal Return		Cumulative	
			Abnormal Return	Z-statistic	Abnormal Return	Z-statistic
Feb. 4	\$2.250	10,100	-6.22	-1.12	-6.22	-1.12
Feb. 5	2.250	4,400	-0.41	-0.07	-6.61	-0.84
Feb. 6	2.250	1,600	0.56	0.10	-6.08	-0.63
Feb. 9	3.250	72,000	45.38	8.20	36.54	3.30
Feb. 10	3.875	68,100	20.55	3.70	64.56	5.22
Feb. 11	3.750	65,200	-3.73	-0.67	58.43	4.31
Feb. 12	3.625	16,300	-2.50	-0.45	54.47	3.72
Feb. 13	3.750	6,800	2.47	0.44	58.28	3.72
Feb. 17	3.750	25,600	-1.39	-0.25	56.09	3.38
Feb. 18	4.500	57,000	20.25	3.67	87.70	5.01
Feb. 19	4.500	23,500	0.17	0.03	88.02	4.79
Feb. 20	4.625	23,600	3.09	0.56	93.83	4.89
Feb. 23	4.250	7,300	-6.92	-1.25	80.42	4.03
Feb. 24	4.250	7,900	0.17	0.03	80.72	3.90
Feb. 25	3.625	24,700	-14.74	-2.67	54.08	2.52
Feb. 26	3.625	6,200	0.61	0.11	55.02	2.49
Feb. 27	3.500	6,200	-3.50	-0.63	49.59	2.17

Note: Returns are expressed in percent. Stock price data is from Center for Research in Security Prices (CRSP) at the University of Chicago. Market model estimation period is February 4, 1986 through February 3, 1987. Market proxy is CRSP value-weighted index of NYSE, AMEX, and NASDAQ stocks. Beta estimate for Artel Communications is 0.56.

EXHIBIT F

**IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF DELAWARE**

IN RE: ADAMS GOLF, INC.
SECURITIES LITIGATION

§
§ CIVIL ACTION NO. 99-371-KAJ
§ (CONSOLIDATED)
§

AFFIDAVIT OF PROFESSOR CHRISTOPHER M. JAMES

1. In this report, I outline my criticisms of the Affidavit of R. Alan Miller in Support of Plaintiffs' Opposition to the Adams Golf Defendants' Motion for Summary Judgment ("Miller's Affidavit") concerning materiality and damages in the Adams Golf Securities Litigation matter. My qualifications are outlined in my expert report dated July 14, 2006. This Affidavit is a supplement to my previous reports, declaration and deposition, and it does not contain any changes to my previous opinions.
2. I have examined the statistical tests outlined in Miller's Affidavit and find that:
 - a. The report does not employ an approach that would be consistent with scientific research in finance, accounting and/or economics and would not be publishable in a peer-reviewed journal.
 - b. The data, procedures and results are not well documented and are hence not readily replicable.
 - c. The empirical/statistical methods are highly suspect and their results are 1) flawed and 2) highly sensitive to very small changes in sample period and approach.
 - d. Finally, Miller does not perform an "Event Study" in any report or affidavit. Moreover, Miller's purported statistical analysis is inconsistent with *any* definition of market efficiency and is so unorthodox as to find no support in any financial economics academic literature.
3. In summary, I conclude that Miller does not employ generally accepted techniques in financial economics and his analyses are not based on any accepted scientific method. As such, his conclusions are suspect and unreliable.

I. Market Efficiency and Event Windows

4. Finance literature has a well-developed event study methodology for analyzing the impact of particular events on stock price. In the context of litigation, the purpose of such an analysis is to distinguish between price movements that are related to the alleged misstatements and price movements that are not related. However, Miller's event study methodology does not meet the standards that would be associated with research that is published in peer-reviewed academic finance, economics and/or accounting journals.¹ In addition, several of the critical steps in his analysis lead to spurious results.
5. First, Miller's twelve-day event window is inconsistent with market efficiency. In an efficient market, stock prices respond immediately to public information that is new and material.² The length of that window depends on the timing of the public announcement. Although a one-day window is generally the most accepted practice, if it is uncertain whether an announcement was released before or after market close, it is reasonable for a researcher to examine the stock price on the published date of the announcement and the date after (*i.e.*, a two-day event window).
6. Plaintiffs cite Mitchell and Netter³ in an attempt to provide academic support to their argument that the existence of leakage disqualifies the use of an event study using one trading day as an event window.⁴ However, it seems that Plaintiffs have taken their quote out of context, as further reading uncovers the following (emphasis added):

In most cases... the bulk of the information is released at the announcement of the event. Because the market processes information rapidly, it is conventional to expand the window only a short period after the announcement. ... [W]ith respect to securities fraud cases, there is substantial variation in the complexity of determining the length of an event window. ... [I]n many securities fraud cases the relevant information is revealed slowly over time, while during the same period investors receive other, sometimes unrelated, information about the firm(s)

¹ For discussion of accepted event study analysis in financial economics and securities litigations see Christopher M. James' Report dated July 14, 2006 (e.g., ¶¶ 16-24, 48-54).

² See Christopher M. James' Report dated July 14, 2006 (¶¶ 34 and 48-50).

³ Mitchell, Mark L. and Jeffrey M. Netter, "The Role of Financial Economics in Securities Fraud Cases: Applications at the Securities and Exchange Commission," *The Business Lawyer* (February 1994).

⁴ Plaintiffs' Answering Brief in Response to Adams Golf Defendants' Motion for Summary Judgment dated October 9, 2006, pp. 37-38, fn. 17.

in question. In the latter case, it is relatively difficult to choose an appropriate window. *The main advice is to carefully identify the exact dates during which the information in question reached the market, and then restrict the window to a short period if possible, generally two or three days around each release of new information.*⁵

Thus, even the literature cited by Plaintiffs emphasizes the necessity of identifying the timing of the *public disclosures* in order to determine the appropriate event window, a task that Plaintiffs have failed to accomplish.

7. I have never seen a peer-reviewed paper or other research that would support the use of a twelve-day window to determine stock price reaction to the release of new information. If public information takes twelve days to be incorporated into the market price, the market for that particular stock should be deemed inefficient; thus the use of such an event window would, in fact, be rejected by peer-reviewed journals as inconsistent with the concept of market efficiency.
8. Lastly, Miller's event windows have no consistency or reliability. In his first two reports,⁶ Miller began his analysis by asserting that a two-day window may be appropriate. He then modified that to a five- to six-day event window. Finally, in this analysis, he uses a twelve-day window. Researchers in financial economics do not use such inconsistent and contradictory event windows. Market efficiency implies that the incorporation time will be substantially similar across events. Miller's analysis undermines the entire concept of market efficiency.

II. Miller's Affidavit Uses an Unorthodox and Unreliable Statistical Methods

9. The statistical models presented in Miller's Affidavit are unorthodox and unreliable. The specific dates selected by Miller to be part of his twelve-day window are arbitrary and appear to be selected to simply obtain his desired results. Miller begins his twelve-day trading window on July 10, 1998 and ends it on July 28, 1998. Miller does not identify

⁵ Mitchell, Mark L. and Jeffrey M. Netter, "The Role of Financial Economics in Securities Fraud Cases: Applications at the Securities and Exchange Commission," *The Business Lawyer* (February 1994), p. 559.

⁶ Expert Report of R. Alan Miller dated July 12, 2006. Rebuttal Expert Report of R. Alan Miller dated July 28, 2006.

any public disclosures related to gray marketing on July 10, 1998 nor does he identify any public disclosures or sources indicating that this information had fully entered the market as of July 28, 1998. His selection of dates is inconsistent with his expert report where he states that the leakage began on July 21, 1998 through a nonpublic Costco purchase order document.⁷ Since Miller has not identified any documents or disclosures that would suggest that any information about gray marketing reached the market during this time period, his analysis is unreliable and incongruous with the financial economic literature.

10. When I examine the possible reasons why Miller could have selected this twelve-day window, one became particularly apparent: this twelve-day window represents the largest decline in Adams Golf's residual stock price. Miller appears to have "data mined" or "cherry picked" his event window. Instead of formulating a hypothesis and testing for its validity (the standard approach in financial economics and in any scientific study), Miller ran many different statistical tests to determine which model would give him the desired result (in this case, a statistically significant model).
11. Even if one considers Miller's flawed and unorthodox methodology, one cannot reach the same conclusions that he does. First, Miller's data, procedures and results are not well documented and are hence not readily replicable. Second, when I repeat a similar non-parametric analysis⁸ as used by Miller to examine event windows of slightly different lengths at the beginning of the class period, my results suggest that Miller may have used trial-and-error when choosing the length of his event window. When I calculate the sum of returns for the first 9, 10, or 11 days, I find that the model did not yield a statistically significant result. Unsurprisingly, the first event window that yields significant results is the 12-day event window. Furthermore, examining 13 and 14 days as an event window also yield significant results. (See Exhibit 17.)
12. Thus, unless Miller can point to a specific and objective reason for beginning his event period on July 10, 1998 and ending it on July 28, 1998, one must be highly suspicious of

⁷ Rebuttal Expert Report of R. Alan Miller dated July 28, 2006, ¶ 22.

⁸ Since Miller's procedures are vague and he did not provide a complete description of the data and methods, I examine two models: 1) a model using residual returns based on a regression of Adams Golf's daily stock returns against the Nasdaq's daily returns; 2) Adams Golf's actual daily returns. Both alternatives yield similar conclusions.

his choice of a twelve-day event window. Again, citing Plaintiffs' source from Mitchell and Netter: "[T]he main advice is to carefully identify the exact dates during which the information in question reached the market, and then restrict the window to a short period if possible, generally two or three days around each release of new information."⁹ Miller does not point to any information related to gray marketing on July 10, 1998¹⁰ nor does he identify any public disclosures or sources indicating that this information had fully entered the market as of July 28, 1998.

13. The second model presented in Miller's Affidavit is also flawed and unreliable. First, the model is flawed because he uses normalized price as a dependent variable, which results in serial correlation. Normalized prices are just cumulative returns, so by using this variable, Miller's regressions violate an important assumption of Ordinary Least Squares regression models—that the dependent variable should *not* be correlated.¹¹ His statistical results are thus biased and inaccurate.
14. Moreover, the second model presented in Miller's Affidavit has similar problems to those of his first model. I test his flawed model using 8-, 9-, 10-, 11-, 13-, 14- and 15-day windows and each model was statistically significant (Exhibit 18). Miller describes in his Affidavit: "The above results demonstrate that the two-slope model provides a statistically significantly better fit than the one-slope model, and provides a substantially more accurate model of the price behavior. In other words, the apparent change in the rate of decline of Adams Golf stock price is statistically significant."¹² Thus, according to Miller's flawed conclusions, any of these time periods may be considered significant. Using Miller's unreliable and flawed methodology, a two-slope model using *any chosen* time period, regardless of length, will yield better results than a one-slope model. Just as with his first model, he has made no attempt to relate the materiality of the gray market information to Adams Golf's stock price movements.

⁹ Mitchell, Mark L. and Jeffrey M. Netter, "The Role of Financial Economics in Securities Fraud Cases: Applications at the Securities and Exchange Commission," *The Business Lawyer* (February 1994), p. 559.

¹⁰ The fact that it was the first trading day in Adams Golf's stock is insufficient; one needs to point out to specific news entering the market. In addition, Adams Golf's stock price increased on July 10, 1998; this increase implies that any information about gray marketing was either not new or immaterial to investors.

¹¹ Greene, William H., *Econometric Analysis*, 4th Edition, 2000, Ch. 6 pp. 220-221.

15. To test Miller's results, I use a more common and accurate analysis to verify if there is a difference between two different time periods. This method is called the Chow Test (see *Econometric Analysis* by W. Greene, 4th Edition, 2000, Ch. 7 pp. 289-291). To conduct a Chow Test, I create a binary (or dummy) variable that is set to equal 1 during the time period that is potentially different from the rest of the estimation period (and 0 otherwise). In this case, the dummy variable is equal to 1 from July 10, 1998 through July 28, 1998, and 0 for the rest of the class period. I also interact this term with the independent variable, so in this case the Nasdaq's returns are multiplied by 1 from July 10, 1998 through July 28, 1998, and 0 during the rest of the class period. Then I regress Adams Golf's stock returns on the dummy variable, the interactive variable and the Nasdaq's returns over the class period. I find that the coefficients on the dummy and interaction variables are statistically insignificant, both independently and jointly. These Chow Test results indicate that the period from July 10, 1998 through July 28, 1998 is not statistically significantly different from the rest of the class period. (See Exhibit 19.)
16. Lastly, the statistical analyses presented in Miller's Affidavit do not allow a researcher to make any conclusions as they relate to the allegations in this case. In particular, his analysis (as flawed and unreliable as it is) only shows that July 10, 1998 to July 28, 1998 may be a different time period in Adams Golf's stock compared to the rest of the class period. Since Miller fails to link these analyses with plaintiffs' specific allegations (*i.e.*, the materiality of the gray marketing allegations), it is impossible to reach a conclusion that public disclosures about the gray marketing impacted Adams Golf's stock during this time period.
17. Based on these analyses, I conclude that the statistical tests presented in Miller's Affidavit are flawed, suspect and unreliable. In addition, Miller used methods that are *not* generally accepted in the field of financial economics to examine stock price reaction to release of new information.

¹² Miller's Affidavit, Attached Statistical Analyses, p. 7.

III. Miller Does Not Perform an "Event Study" in Any Report or Affidavit

18. Finally, despite Miller's references to event studies and regression analyses in his Affidavit, Miller did not perform a proper event study. An event study is a widely used and generally accepted analytical framework for investigating the effects of information on stock price. Over the past thirty-five years, the event study methodology has been used and refined in academic research in the fields of finance, economics and accounting.¹³ An event study provides an objective measure of whether a particular disclosure caused a significant change in the total mix of information available to the market.
19. In his Affidavit, Miller fails to show a cause-and-effect relationship between public disclosures about gray marketing and stock returns. Significantly, he makes no attempt to distinguish between allegation related and non-allegation related price declines. Indeed, his statistical tests are done in a way that does not allow him to even make such a distinction.
20. Because plaintiffs have not conducted any event study in this matter, they have no scientific basis for asserting that the observed stock price movements occurred in response to any material new information about gray marketing that entered the public domain.
21. Based on the above, I conclude that the so-called statistical analyses presented in Miller's Affidavit and the personal observations set forth in the previous Miller Reports are unreliable, are flawed, are considered unorthodox in the financial economics community and would not satisfy the basic requirements of a peer-reviewed journal publication.

¹³ Brealey and Myers, *Principles of Corporate Finance*, 7th Ed., 2003, Chapter 13, includes an introduction to the event study analysis used in this report; see pp. 366-368. See also Brown and Warner, "Using daily stock returns: The case of event studies," *Journal of Financial Economics* 14 (1985), pp. 3-31; John J. Binder, "On the Use of the Multivariate Regression Model in Event Studies," *Journal of Accounting Research*, Vol. 23, No. 1, Spring 1985, pp. 370-383; and Campbell, John, Andrew W. Lo and A. Craig MacKinlay, *The Econometrics of Financial Markets*, Princeton University Press, 1997, Chapter 4. Also see a discussion in my prior report dated July 14, 2006 ¶¶ 16-24, 48-54.



Christopher M. James

10/30/06
Date

Cynthia Leon Frenchman



10-30-06

personally known to me

UNITED STATES DISTRICT COURT
DISTRICT OF DELAWARE

CERTIFICATE OF SERVICE

I hereby certify that on October 30, 2006, I have caused the foregoing to be served by Hand Delivery which has also been filed with the Clerk of Court using CM/ECF which will send notification of such filing(s) to the following:

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I hereby certify that on October 30, 2006, I have sent by electronic mail the foregoing document(s) to the following non-registered participants:

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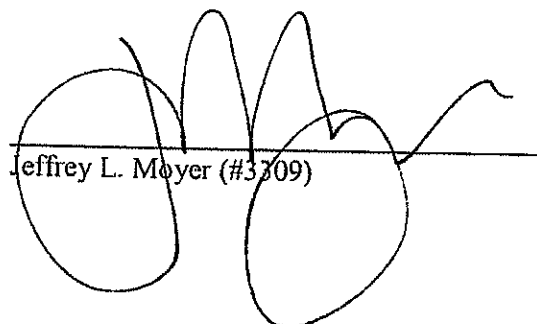

Jeffrey L. Moyer (#3709)

EXHIBIT 17

Exhibit 17

Summation of Adams Golf's Stock Returns

Source: CRSP, Affidavit of R. Alan Miller dated October 6, 2006

	<u>Residual Returns</u>	<u>Raw Returns</u>
9 Days		
Sum of Returns in First Period (7/13/98 - 7/23/98)	-16.34%	-29.96%
Total Number of Periods	65	65
Number of Periods for Which the Sum of Returns is <= First Period	15	15
Percentage	23.08%	23.08%
10 Days		
Sum of Returns in First Period (7/13/98 - 7/24/98)	-17.80%	-33.25%
Total Number of Periods	64	64
Number of Periods for Which the Sum of Returns is <= First Period	11	14
Percentage	17.19%	21.88%
11 Days		
Sum of Returns in First Period (7/13/98 - 7/27/98)	-27.76%	-44.41%
Total Number of Periods	63	63
Number of Periods for Which the Sum of Returns is <= First Period	6	9
Percentage	9.52%	14.29%
12 Days		
Sum of Returns in First Period (7/13/98 - 7/28/98)	-37.16%	-57.53%
Total Number of Periods	62	62
Number of Periods for Which the Sum of Returns is <= First Period	1	2
Percentage	1.61%	3.23%
13 Days		
Sum of Returns in First Period (7/13/98 - 7/29/98)	-34.73%	-57.53%
Total Number of Periods	61	61
Number of Periods for Which the Sum of Returns is <= First Period	2	3
Percentage	3.28%	4.92%
14 Days		
Sum of Returns in First Period (7/13/98 - 7/30/98)	-34.75%	-56.58%
Total Number of Periods	60	60
Number of Periods for Which the Sum of Returns is <= First Period	2	3
Percentage	3.33%	5.00%

Note: Residual Return = Actual Return - (-0.01 + (1.19 * Nasdaq Return))

EXHIBIT 18

Exhibit 18

Analysis of Miller's Two-Slope Models

Source: CRSP, Affidavit of R. Alan Miller dated 10/6/06

	8-Day 7/13/98 - 7/22/98	9-Day 7/13/98 - 7/23/98	10-Day 7/13/98 - 7/24/98	11-Day 7/13/98 - 7/27/98	12-Day 7/13/98 - 7/28/98	13-Day 7/13/98 - 7/29/98	14-Day 7/13/98 - 7/30/98	15-Day 7/13/98 - 7/31/98
Adams Golf								
Adjusted R-Squared	93.1%	93.7%	94.4%	94.5%	94.3%	94.3%	94.3%	94.3%
Coefficients (T-statistics)								
Time ¹	-0.01 (-17.16)	-0.01 (-16.90)	-0.01 (-16.90)	-0.01 (-16.31)	-0.01 (-15.59)	-0.01 (-15.12)	-0.01 (-14.63)	-0.01 (-14.08)
July Dummy ²	0.42 (8.59)	0.45 (10.26)	0.47 (11.90)	0.49 (13.06)	0.51 (13.73)	0.52 (14.26)	0.52 (14.57)	0.51 (14.57)
Time / July Dummy Interaction ³	-0.02 (-2.12)	-0.03 (-3.49)	-0.03 (-4.81)	-0.03 (-6.34)	-0.04 (-7.96)	-0.04 (-9.21)	-0.04 (-10.10)	-0.03 (-10.74)
Constant	0.64 (37.31)	0.63 (37.29)	0.62 (37.51)	0.61 (36.31)	0.61 (34.51)	0.61 (33.31)	0.61 (32.14)	0.60 (30.85)

Note:

Bolded entries are significant at the 95% confidence interval.

¹ Time variable is the observation number.

² July Dummy variable equals 1 during the 8-, 9-, 10-, 11-, 12-, 13-, 14- or 15-day period in July that is potentially different from the rest of the estimation period (and 0 otherwise).

³ Time / July Dummy interaction variable is an interaction of the two other variables, so the observation number is multiplied by 1 during the 8-, 9-, 10-, 11-, 12-, 13-, 14- or 15-day period in July, and 0 during the rest of the estimation period.

EXHIBIT 19

Exhibit 19

Chow Test

Source: CRSP; Affidavit of R. Alan Miller dated 10/6/06

	<u>Regression Results</u>
Adjusted R-Squared	21.7%
Coefficients (T-statistics)	
Nasdaq	1.11 (3.83)
July Dummy ¹	-0.03 (-1.64)
Nasdaq / July Dummy Interaction ²	2.47 (1.44)
Constant	-0.01 (-1.10)
F-statistic	2.88

Note:

Bolded entries are significant at the 95% confidence interval.

¹ July Dummy variable equals 1 during the 12-day period from 7/13/98 to 7/28/98 (as suggested by Miller) and 0 for the rest of the estimation period.

² Nasdaq / July Dummy Interaction variable is an interaction of the two other variables, so the Nasdaq return is multiplied by 1 during the 12-day period from 7/13/98 to 7/28/98, and 0 during the rest of the estimation period.